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# USSR Report

LIFE SCIENCES

BIOMEDICAL AND BEHAVIORAL SCIENCES

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29 APRIL 1987

USSR REPORT  
LIFE SCIENCES  
BIOMEDICAL AND BEHAVIORAL SCIENCES

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UDC 612.821

CIRCULATORY CHANGES IN CAROTID ARTERY BASIN IN RESPONSE TO ANTIORTHOSTASIS  
AND ANTIORTHOSTATIC BED REST

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 4 Apr 85) pp 755-762

[Article by B.M. Fedorov, Ye.N. Streltsova and T.V. Sebekina, Moscow]

[Abstract] An analysis was conducted on the hemodynamic sequelae of 30-day antiorthostatic bed rest ( $-4^{\circ}\text{C}$ ) in 9 male subjects. Doppler sonography revealed uniform changes in the subjects. In the first few days blood flow velocity diminished 2-fold in the common carotid artery, and 3- to 4-fold in the ophthalmic branch of the internal carotid artery, demonstrating a decrease in the blood supply to the brain. An increase in the pulsation in the large- and moderate-caliber arteries reflected a retarded outflow rather than an increase in blood supply to the head. Resistance of the carotid arteries peaked 5 days after the initiation of orthostasis, diminishing during the following 3-4 weeks toward baseline levels. Studies on dogs subjected to orthostasis ( $-45$  or  $-90^{\circ}$ ) for 120 min led to a pronounced increase in the pressure of the 4th ventricle and in the jugular veins. The resistance of the carotid arteries increased and blood flow diminished, with the carotic blood pressure remaining relatively constant. These observations were combined into the interpretation that changes in the tone of the carotid arteries represented a reflex mechanism designed to minimize venous stasis. With time, near normal reactivity of the carotid artery basin returns. References 21: 20 Russian, 1 Western.

12172/9835

CSO: 1840/242

## HEMODYNAMIC EFFECTS OF NEGATIVE PRESSURE IN LOWER BODY

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 10 Oct 84) pp 763-769

[Article by M.M. Mirrakhimov, T.A. Azhimamatov and T.B. Baltabayev,  
Kirghiz Scientific Research Institute of Cardiology, Frunze]

[Abstract] The cardiovascular response to short-term (15 min) lower body negative pressure (20-40 mm Hg) was evaluated in a cohort of 42 healthy males with a mean age of  $53 \pm 2.2$  years, in order to assess the diagnostic value of this noninvasive technique. The technique was effective in decreasing the venous return to the heart in a controlled manner. The cardiological effects consisted of a marked reduction in the preload, in the size of the heart chambers, and in the cardiac output in the absence of any significant changes in the contractile function of the myocardium. The most remarkable changes were evident within the initial 10 min, with complete stabilization of the parameters of interest by 15 min. Restoration of normal lower body pressure over 2-3 sec resulted in a short-term volume overload leading to an increase in the stroke volume, a reduction in the heart rate, diminished peripheral resistance, and enhanced myocardial contractility. Reduction of lower body pressure was, therefore, seen to be an informative and safe technique for assessing myocardial contractility. Figures 4; references 19: 11 Russian, 8 Western.

12172/9835

CSO: 1840/242

## INTERACTION OF MACULA AND SEMICIRCULAR CANALS IN ANGULAR STABILIZATION OF MAN IN SPACE

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 22 May 84; in final form 11 Sep 84) pp 123-127

[Article by V.M. Gusev and V.A. Kislyakov (deceased), Institute of  
Physiology imeni I.P. Pavlov, USSR Academy of Sciences, Leningrad]

[Abstract] A mathematical model has been advanced to explain the interactions of two components of the human vestibular apparatus in maintaining human angular stability in space: the macula and the semicircular canals. The analysis was conducted in terms of measuring devices or sensors reflecting, in practice, otoconial movement and position of the semicircular canals, with the assumption that in the unperturbed state both systems of coordinates coincide. Stabilization of the body presumed small angular deviation from a local vertical plane and identical angular displacements for the head and the body. Computer-facilitated calculations have shown that angular stability

in space is dependent on combined function of the macula and the semicircular canals. The semicircular canals ensure stability over short periods of time and in situations with rapidly changing external factors. The function of the macula assures stability on prolonged exposure to slowly varying external factors. Figures 4; references 7: 4 Russian, 3 Western.

12172/9835

CSO: 1840/221

## AGROTECHNOLOGY

### NEW GROWTH STIMULATOR: MIVAL

Moscow TASS in Russian 23 Dec 86

[Text] A biological growth stimulator, MIVAL, developed by Soviet specialists, is the future of cotton growing, staff members of the National Research Institute of Cotton Growing believe.

The stimulator got its name from the first names of its authors, Mikhail Voronkov and Valery Dyakov, the newspaper TRUD said today.

Farms in six districts of the Tashkent region made use of the stimulator in 1986, the newspaper reports. In the Bekabad District, for instance, MIVAL-treated seeds gave stronger shoots, which grew faster, and harvesting began 12 days earlier than usual. Moreover, almost all the cotton was rated first rather than second grade. The farm will get 100 rubles more per ton of raw cotton of a better grade, and the harvest was far larger than usual as well. MIVAL makes the seeds resistant to weather fluctuations. The quantity of seeds can be reduced by 20-30 per cent and they can be planted 2-3 days earlier.

The newspaper says that a large group of silicon-organic compounds which are biologically active have been developed in the USSR and that MIVAL and similar biological stimulators are produced commercially on an experimental basis. Studies are being conducted into their application. They have been tested in virtually all the climatic zones of the country on different crops.

/9835

CSO: 1840/262-E



UDC 576.6.851.155

NITROGEN FIXATION CHARACTERISTICS AND FRACTIONAL COMPOSITION OF RHIZOBIUM  
MELILOTI TRANSCONJUGANT PROTEIN UPON INTRODUCTION OF pRD1 PLASMID

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE,  
KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 86  
(manuscript received 17 Jan 86) pp 65-67

[Article by M.M. Nichik, Ye.D. Krugova and L.M. Yakovets, Institute of  
Physiology of Plants, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] A study of the possibility of transfer of plasmids carrying the nitrogen-fixation genes by interspecies conjugation and the characteristics of the transconjugants produced is of both theoretical and practical significance. Studies were performed of the transfer, preservation and expression of nitrogen-fixation genes using rhizobium meliloti Ch. and the plasmid pRD1. Transconjugants of lucerne rhizobium with altered and improved nitrogen-fixation and fractional composition of cell proteins were obtained for the first time. The transconjugants of R. meliloti Ch (Str<sup>a</sup>) were obtained by interspecies conjugation of E. coli JC5466 (Tcr, Km<sup>r</sup>), with the recombinant plasmid pRD1. Selection of transconjugants were performed in medium 79 Ca with three antibiotics--Str, Tc and Km. The interspecific conjugation of E. coli and R. meliloti Ch. yielded transconjugants of rhizobium with frequency  $3.3 \cdot 10^{-7}$  transfers of medication resistance markers. A study of the stable clones under sterile microvegetation experimental conditions show that they form nodules on the roots of lucerne differing from each other and from the initial strain in terms of influence on growth productivity of the plants. The introduced pRD1 plasmid has a significant influence on the metabolism of rhizobium, manifested as a change in the level of nitrogen fixation and fractional composition of cell proteins. Figures 2; references 9: 2 Russian, 7 Western.

6508/9835  
CSO: 1840/256

UDC 577.112:616-092.9

CHARACTERIZATION OF PEPTIDE FRACTIONS ISOLATED FROM RAT BRAIN UNDER ISCHEMIA

Kiev UKRAINSKIY BIOKHMICHESKIY ZHURNAL in Russian Vol 57, No 6, Nov-Dec 85  
(manuscript received 4 Apr 85) pp 13-17

[Article by A. Musatov, M. Gottlieb and M. Khavko, Center of Physiological Sciences, Institute of Neurobiology, Slovak Academy of Sciences, Czechoslovak Socialist Republic, Kosice]

[Abstract] Neuropeptides appear to be participating in neurotransmission and neuroregulation processes, in transcription and translation, etc. It was shown that protein biosynthesis processes undergo definite modifications during ischemia of neuron tissues, along with alteration of the transcription. In this study on male rats it is shown that temporary brain ischemia results in distinct quantitative, qualitative and functional changes of the amino-acid composition in isolated peptide fractions. Evidently, new peptides are formed during ischemia with different properties, capable of affecting metabolic processes in tissues. An assumption is made that these peptides react with DNA, stabilizing its bispiral structure and blocking the initiation sites for RNA polymerases. Figures 4; references 13 (Western).

7813/9835

CSO: 1840/189

UDC 577.115 + 577.152.361:576.354.46

EFFECT OF A<sub>2</sub> PHOSPHOLIPASES OF BEE AND COBRA VENOMS ON PHOSPHOLIPD COMPOSITION AND Na<sup>+</sup>, K<sup>+</sup>-ATPase ACTIVITY OF SYNAPTOSOMES

Kiev UKRAINSKIY BIOKHMICHESKIY ZHURNAL in Russian Vol 57, No 6, Nov-Dec 85  
(manuscript received 21 Sep 84) pp 28-34

[Article by G.L. Vavilova, O.V. Kirsenko and V.I. Kocherga, Institute of Biochemistry imeni A.V. Palladin, UkSSR Academy of Sciences, Kiev]

[Abstract] An attempt was made to answer the following questions in this study: what changes occur in the composition of synaptosome phospholipids

after treatment with  $A_2$  phospholipases ( $A_2PL$ ) from bee and cobra venoms; what effect does this  $A_2PL$  have on transport ATP-ase regulating Na ion content in cells which is necessary for transportation of choline into synaptosomes and if the activity of transport ATPase is affected, can it be reversed by exogenous phospholipids? It was shown that these phospholipases did induce splitting of phosphatidylethanolamine (I), phosphatidylcholine (II) and phosphatidylserine (III); the  $Na^+$  and  $K^+$ -ATPase was inhibited and  $Mg^{2+}$ -ATPase was activated. The  $A_2PL$  from bee venom was more active than  $A_2PL$  from cobra. Administration of exogenous II and III restored partially or completely the activity of ATPase; I was not effective. The degree of restoration depended on the concentration of phospholipases and the added phospholipids. Figure 1; references 15: 6 Russian, 9 Western.

7813/9835  
CSO: 1840/189

#### SYNTHETIC $Ca^{++}$ -DEPENDENT PROTON CARRIER

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 29 May 84; in final form 17 Dec 84) pp 157-159

[Article by N.V. Lukoyanov, O.A. Rayevskiy, A.S. Shtepanek and T.N. Kudrya, Institute of Physiologically Active Substances, USSR Academy of Sciences, Chernogolovka, Moscow Oblast; Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Trials were conducted with 1,5-[(3,3'-dimethylphosphate)-diphenoxy]-3-oxapentane (DDOP) to determine its effectiveness in increasing the conductivity of bilayer lipid membranes prepared from total brain lipids of the rabbit. The electrical measurements demonstrated that  $6.8 \times 10^{-4}$  M DDOP had no effect on conductivity of membranes prepared either in NaCl or KCl. However, addition of  $CaCl_2$  or  $MgCl_2$  enhanced conductivity, with the effects of DDOP having a maximum at pH 7.0. The null current potential in the pH 7.0-8.0 range with  $10^{-2}$  M  $CaCl_2$  and  $10^{-3}$  M DDOP was  $20 \pm 5$  mV. Rather than the expected  $pK'_{DDOP} = pK''_{DDOP} < 3$  values, the actually determined values were  $pK'_{DDOP} = 1.2$  and  $pK''_{DDOP} = 7.7$ . The presence of an undissociated hydroxyl group was also confirmed by IR spectroscopy of the DDOP- $Ca^{++}$  complex at pH 7.0, leading to the conclusion that the differences between theoretical and experimental values indicated intramolecular hydrogen bond formation between the phosphate groups and formation of a pseudomacrocyclic structure (analogous to those of crown ethers). The effects of  $Ca^{++}$  and  $Mg^{++}$  were attributed to lyophilization of ionized forms of DDOP as a result of complex formation. Figures 1; references 14: 5 Russian, 9 Western.

12172/9835  
CSO: 1840/221

PURIFICATION OF TICK-BORNE ENCEPHALITIS VIRUS ON TRIS-MODIFIED POROUS GLASSES

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 4, Jul 85  
(manuscript received 12 Jun 84, revised manuscript received 12 Dec 84)  
pp 273-278

[Article by I.V. Krasilnikov, L.V. Elbert, V.N. Borisova and  
L.A. Nakhapetyan, Institute of Poliomyelitis and Viral Encephalies,  
USSR Academy of Medical Sciences; All-Union Scientific Research Biotechnical  
Institute, Moscow]

[Abstract] Results of purification of tick-borne encephalitis (Sofin strain) virus by use of microporous glasses, modified by tris-hydroxymethyl-aminomethane for gel-filtration chromatography of virus suspensions are presented and conditions affecting the purified virus yield are discussed. The most-complete purified virus yield with minimum adsorption of extrinsic proteins (nearly 20 percent) occurred with the use of porous glasses with concentrations of the modifier grafted to the surface of approximately  $0.01 \mu\text{g eq/m}^2$ . Virus yield depended also upon the pH of the eluting buffer with complete elution of the virus when the eluant pH exceeds 7.6. The procedure made it possible to remove more than 99 percent of extrinsic proteins from the virus suspensions. The modification efficiency was the same for purification of infectious and inactivated tick-borne encephalitis virus preparations. Figures 4; references 16: 7 Russian, 9 Western.

2791/9835  
CSO: 1840/185

UDC 547.963.32:577.1

COMPLEMENTARILY-ADDRESSED MODIFICATION OF DNA IN COMPOSITION OF METAPHASE CHROMOSOMES AND INTERPHASE CHROMATIN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 1, Nov 86  
(manuscript received 5 May 86) pp 234-236

[Article by N.D. Belyayev, V.V. Vlasov, N.D. Kobets, Ye.M. Ivanova and  
L.A. Yakubov, Novosibirsk Institute of Bioorganic Chemistry, Siberian  
Department, USSR Academy of Sciences]

[Abstract] A study of the feasibility of complementarily addressed modifications of DNA in two states (in chromatin, isolated from interphase cells and in isolated metaphase chromosomes) used derivatives of synthetic oligonucleotides carrying alkylating 4-(N-2-ethyl chloride-N-methylamino) benzyl phosphamide groupings on the 5'-terminal fragments. Comparison of the degree of DNA modification in interphase chromatin with that in interphase chromosomes showed that DNA availability for both the nanothymidylate derivative and hexadecathymidylate derivative was 2.5-3-fold lower in the



chromosomes than that in the chromatin. Reactions of chromosomal DNA and that of chromatin were specific. DNA separated from chromatin alkylated oligo dT and d(AC)<sub>6</sub> derivatives by at least one order of magnitude less than that in chromatin and chromosomes. The higher degree of DNA modification by derivatives of oligonucleotides (pT)<sub>16</sub> than that from derivatives of oligonucleotides (pT)<sub>9</sub> was attributed to the capacity of the first oligonucleotides to form complexes with many sequences due to formation of incomplete complexes with several short adjacent oligod(A)-segments in single-strand DNA sequences or to the high capacity to untwine 2-strand DNA segments by forming more stable complexes. Data obtained confirmed the feasibility of conducting complementarily addressed DNA modification in cell chromatin and in metaphase chromosomes. References 10: 6 Russian, 4 Western.

2791/9835  
CSO: 1840/178

UDC 577.1:547.963.3

#### MECHANISM OF ANTIOXIDANT ACTION OF CERULOPLASMIN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 1, Nov 86  
(manuscript received 16 Apr 86) pp 237-241

[Article by A.I. Yaropolov, A.G. Sergeyev, V.V. Basevich, I.V. Berezin, corresponding member, USSR Academy of Sciences, A.A. Revina and V.Ye. Zubarev, Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences; Institute of Electrochemistry A.M. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] Human ceruloplasmin from donor blood was used to study the mechanism of antioxidant action of ceruloplasmin in order to explain its capacity to reduce the level of superoxide radicals. It was found that ceruloplasmin cannot catalyze disproportionation of O<sub>2</sub><sup>-</sup>-radical like superoxide dismutase can but it does have pronounced electron acceptor properties. Different compounds such as bivalent iron ions and solvated electron and different radicals may serve as an electron donor. Ionizing radiation changes ceruloplasmin activity in relation to different substrates. Ceruloplasmin is highly resistant to ionizing radiation. Consideration of the high ceruloplasmin level in blood plasma and data obtained in this study confirmed the fact that ceruloplasmin may be the basic antioxidant in blood plasma but the mechanism of its action differs from that of superoxide dismutase. Figures 3; references 11: 1 Russian, 10 Western.

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## BIOPHYSICS

### CONDUCTIVITY AND STRUCTURAL TRANSITIONS IN BILAYER LIPID MEMBRANES

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 26 Nov 84) pp 43-47

[Article by T.V. Vyshenskaya and V.I. Pasechnik, Institute of  
Radiotechnology and Electronics, USSR Academy of Sciences, Moscow]

[Abstract] A study was conducted on the temperature dependence of the conductivity of a bilayer lipid membrane prepared from egg lecithin, to assess such membranes as models of membrane susceptibility to various physical factors. Over a temperature interval of 14 to 44°C, five structural transitions in conductivity were detected at  $T_g$  points. The current fluctuations were on the order of 150 pC at 20-42°C, with open and closed channel values of 4-27 and 3-90 sec, respectively. The peak conductivities and the  $T_g$  values led to the interpretation that the observed effects were attributable to the appearance of laterally isolated domains of lipid molecules in the bilayer. Such domains, possessing identical fatty acid composition, arise at temperatures close to those for gel-liquid crystal transition temperatures. The increase in conductivity involves current flux along the domain boundary or at their surfaces. These observations demonstrate that bilayer lipid membranes prepared from natural lipids seem to be promising models for studying the effects of various physical factors on biological membranes. Figures 3; references 24: 11 Russian, 13 Western.

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CSO: 1840/221

STRUCTURE AND CONDUCTIVITY AT CONTACT SITE OF TWO ARTIFICIAL LIPID-  
PROTEOLIPID MEMBRANES

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 4 Jan 85) pp 64-67

[Article by M.Z. Gyulkhandanyan and K.G. Manukyan, Institute of  
Biochemistry, Armenian SSR Academy of Sciences, Yerevan]

[Abstract] Attempts were made to obtain a better approximation of biological membranes by preparing a bilayer lipid membrane from the white matter of bovine brain, containing 45-50 wt% lipid and 50-55 wt% proteins. Light reflection studies demonstrated that the preparation consisted of fused areas leading to the formation of thickened proteolipid nodes, as well as conventional bilayer membranes. The latter structure maintained an interlaminar distance of 30-40 nm, with the nodal areas forming contact sites between two such bilayer membranes. The nodal thickenings extended 15-20 nm from the surface of the double bilayer structure, and, on the internal side, prevented close approximation of the two bilayers, as well as at the site of contact of two bilayers, increased sharply as NaCl or KCl concentration increased from 1 to 100 mM. In 10 or 100 mM NaCl, the conductivities for single and double bilayers was identical, but, in 10 and 100 mM KCl, decreased 3.0- to 3.5-fold (remaining one- to two-orders of magnitude greater than that of single bilayer or the double bilayer at contact site). These observations indicate that proteolipid regions serve as contact sites between two bilayer lipid membranes, and as sites of increased permeability to ions, especially  $K^+$ . Figures 1; references 12: 5 Russian, 7 Western.

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CSO: 1840/221

ELECTROMECHANICAL AND REACTIVE DIFFUSION SYSTEMS IN INTRANEURONAL  
INFORMATION PROCESSING: EFFECTS OF CALCIUM INFLUX AND INTRACELLULAR  
CALCIUM LEVELS ON cAMP ACTION

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 13 Mar 84; in final form 25 May 85) pp 87-93

[Article by Ye.A. Liberman, S.V. Minina, Z.V. Modebadze, T.A. Mamikonova,  
O.L. Myakotina, L.M. Tsofina and N.Ye. Shlovskiy-Kordi, Institute of  
Information Transfer Problems, USSR Academy of Sciences, Moscow]

[Abstract] Experimental and literature data were considered in order to define the role of Ca in cAMP-induced action potentials and ion fluxes in neurons. The basic findings attested to the fact that an increase in intracellular free  $Ca^{++}$  activates phosphodiesterase and diminishes the effective [cAMP], and that a decrease in the effective cAMP leads to a decrease in cAMP-induced changes in membrane potential and ion flow.

Furthermore, the effects of cAMP have been shown to be due to an increase in  $\text{Na}^+$  permeability and a reduced  $\text{K}^+$  permeability. Additionally, constant introduction of  $\text{Ca}^{++}$  into a neuron or its release from mitochondria or other intracellular depots by uncouplers of oxidative phosphorylation or by arsenate increases the amplitude and the duration of cAMP-induced spikes. Vanadate (an inhibitor of  $\text{Ca}^{++}$  and other ATPases) diminishes the effects of cAMP injection. Intracellular injection of  $\text{Ca}$ -EGTA-buffer with  $10^{-7}$  M free  $\text{Ca}^{++}$  enhances the effects of cAMP; enhancement is less pronounced with  $(1-2) \times 10^{-7}$   $\text{Ca}^{++}$ . Finally, EGTA with  $10^{-5}$  M free  $\text{Ca}^{++}$  diminishes the effects of cAMP. These observations were interpreted to indicate that generation of action potential is under the control of cAMP, and that  $\text{Ca}^{++}$  acts on cAMP in a manner designed not to affect potential generation by the intact neuron. Figures 5; references 33: 10 Russian, 23 Western.

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CSO: 1840/221

#### EFFECTS OF COSMO-HELIO-GEOPHYSICAL FACTORS ON IN VITRO BACTERIAL AGGLUTINATION

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 10 Apr 84; in final form 25 Oct 84) pp 94-98

[Article by A.M. Opalinskaya and L.P. Agulova, Siberian Physicotechnic Institute imeni V.D. Kuznetsov, Tomsk]

[Abstract] A number of factors representing cosmo-helio-geophysical events were analyzed for their effects on in vitro agglutination of *Salmonella typhosa* by antibodies. The nephelometric studies were conducted over a 6 year period in years with low (1973, 1974) and high (1977-1980) solar activities. The serologic results were shown to be indeed dependent on such factors. In addition, agglutination was observed to be affected by the neutron component of cosmic rays: diminished neutron component was accompanied by more pronounced agglutination. Shielding the test tubes with steel or Permalloy diminished agglutination, demonstrating that electromagnetic lines of force also have a profound effect on the reaction. These observations demonstrated the influence that a variety of cosmic, solar, and geomagnetic factors may exert on the outcome of bacterial agglutination tests. Figures 5; references 10 (Russian).

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## MODEL FOR CONTROL OF MOVEMENT OF MULTIARTICULAR EXTREMITIES

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 8 Jan 85) pp 128-138

[Article by M.B. Berkinblit, I.M. Gelfand and A.G. Feldman, Institute of Information Transfer Problems, USSR Academy of Sciences, Moscow]

[Abstract] Basically qualitative description is provided for the directed movements of a multijoint extremity, with application to the limb movements of humans and pitted frogs. The model rests on two fundamental principles, the first of which holds that control signals are formulated individually for each joint. Such signals are intended to approximate the extremity to its goal, but are not affected by the signal inputs to the other joints in the extremity. In this sense, the joints function as a 'collective' of automata first described by M.L. Tsetlin, each member of which acts independently in accordance with the results achieved by the entire 'collective'. The second principle holds that the kinematics, trajectory of movement, as well as the forces necessary for the movement are not directly programmable by the control system. The control system varies only the parameters that determine the equilibrium state of each joint, with movement arising as a result of a change in this equilibrium state. It is in terms of the last statement, i.e., the fact that the control system varies only the parameters of the equilibrium state of each joint, that this model differs from all other proposals. Figures 4; references 16: 9 Russian, 7 Western.

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## DIRECT DETECTION OF SELECTIVE LASER CLEAVAGE OF DNA

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86  
(manuscript received 17 Dec 84) pp 148-149

[Article by L.Z. Benimetskaya, N.V. Bulychev, V.V. Gorn, A.L. Kozionov, A.V. Lebedev, S.Yu. Novozhilov, M.A. Podyminogin and M.I. Shotkman, Institutes of Automation and Electrometry and of Bioorganic Chemistry, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] A selective laser cleavage of DNA was obtained in a system employing synthetic oligodeoxynucleotides, in which one of the complementary chains carried a dansyl chromophore. Irradiation with  $N_2$  laser pulses (337 nm, 100 MW/cm<sup>2</sup>, 240 J/cm<sup>2</sup> dose) and densitometry of the gel-electrophoretic patterns demonstrated selective cleavage at the probable site of dansyl group incorporation. The cleavage data were consistent with a two-quantum energy transfer from the chromophoric group to the cleavage site over a distance of one or two nucleotides. Figures 1; references 9: 4 Russian, 5 Western.

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# PARAMETRIC RESONANCE AND AMPLIFICATION OF PERIODIC PERTURBATIONS IN MEMBRANES CONTAINING INACTIVABLE ION CHANNELS

Moscow BIOFIZIKA in Russian Vol 30, No 5, Sep-Oct 85  
(manuscript received 4 Feb 85) pp 853-857

[Article by N.I. Markevich and Ye.Ye. Selkov, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] A mathematical study was conducted to demonstrate parametric resonance and parametric amplification of periodic perturbations of potential differences in membranes involved in ion transport with inactivation of the channels. The resultant data indicated that periodic changes in membrane capacitance with a frequency of ca.  $2\omega_0$  ( $\omega_0$  = inherent angular frequency of the membrane), or of the applied current, may lead to the onset of stable autooscillations with a frequency of ca.  $\omega_0$ . The latter situation requires that the amplitude of capacitance modulation,  $m$ , or that of the external current,  $i_0$ , exceed certain critical values,  $m_{cr}$  or  $i_{cr}^0$ , respectively. Induction of autooscillations by AC with a frequency of ca.  $2\omega_0$  has the characteristics of parametric resonance. The latter is ascribed to the fact that equivalent membrane inductance depends on the ionic current and changes periodically with a frequency of ca.  $2\omega_0$ , as does the ionic flow. Small-amplitude changes in the capacitance ( $m \ll m_{cr}$ ) at a frequency of ca.  $2\omega_0$  may lead to a marked amplification of periodic perturbations with a frequency of ca.  $\omega_0$ . Figures 4; references 14: 8 Russian, 6 Western.

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CSO: 1840/219

# CYTOSKELETON AND MECHANORECEPTION THRESHOLDS

Moscow BIOFIZIKA in Russian Vol 30, No 5, Sep-Oct 85  
(manuscript received 30 Nov 84) pp 858-863

[Article by V.I. Pasechnik, Institute of Radiotechnology and Electronics, USSR Academy of Sciences, Moscow]

[Abstract] A mathematical analysis was conducted on the thresholds of sensitivity of mechanoreceptors on the basis of local membrane deformations by cytoskeletal fibers at the point of attachment, and the manner in which such fibers undergo deformation in hair (Corti's) cells. Treating the receptor membrane as an elastic plate, calculation of local deformation at the site of junction, expressed by  $\epsilon_s$ , resulted in the demonstration that  $\epsilon_s \sim 1/R$ , where  $l$  = absolute displacement of the area affected by the applied force, and  $R$  = is the small region of the membrane that is affected and comparable in size with the thickness of the membrane (i.e., on nm scale). The estimated value applicable to the hair cells with a filament deflection of 0.1 nm is on the order of  $\epsilon_s \sim 10^{-4}$ , exceeding by an order of magnitude the values typical of the deflection of an individual cilium. Application



of this approach to the Pacinian corpuscles led to calculation of much larger values for  $\epsilon$ . These observations indicate that the cytoskeletal elements are a key factor in determining the sensitivity of mechanoreceptors. Figures 2; references 17: 12 Russian, 5 Western.

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#### CONTROL OF HUMAN LOCOMOTION

Moscow BIOFIZIKA in Russian Vol 30, No 5, Sep-Oct 85  
(manuscript received 18 Sep 84) pp 900-904

[Article by V.A. Bogdanov, Institute of Information Transfer Problems,  
USSR Academy of Sciences, Moscow]

[Abstract] A skeletal model and human gait were analyzed to determine whether control of human locomotion is characterized by isoenergetic control mechanisms, as has been demonstrated in the case of rhythmic hand and elbow movements [Bogdanov, VA, Biofizika, 29: 1053, 1984]. Using the mathematical approach described previously and linearization of small increments of movement, the experimental data were transformed into normal coordinates. Calculations of muscle force moments demonstrated that locomotion is described by elliptical trajectory parameters, demonstrating a close fit between ideal isoenergetic movements and actual locomotion. In the final analysis the musculature was deemed to function as a reversible elastic linkage system, with the energy expenditures less dependent on the actual trajectory of motion than on the kinematic conditions at a fixed, discrete switchover moment. Figures 2; references 11: 9 Russian, 2 Western.

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CSO: 1840/219

## BIOTECHNOLOGY

### GENETIC ENGINEERING IN CREATION OF VACCINES BASED ON VIRAL CAPSID PROTEINS

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 3, May 85  
(manuscript received 9 Aug 84) pp 254-265

[Article by T.I. Tikhonenko, Institute of Applied Molecular Biology and Genetics, USSR Academy of Medical Sciences, Moscow]

[Abstract] A review is presented on the current status of the use of genetic engineering for the synthesis of viral vaccines based on capsid proteins. To date, bacterial systems have been found inadequate to the task, at least with respect to influenza A, hepatitis B, and foot-and-mouth viruses. This failure has largely been due to requirements for antigenic complexity and post-translation modifications, which are not met by the monomers produced by genetically engineered bacterial systems. However, biotechnology relying on animal eukaryotic and yeast systems appears to be much more promising in the production of fully antigenic capsid proteins in adequate yields. In part, this is due to the fact that biochemically the animal eukaryotic and yeast systems are able to reproduce quaternary protein complexes with considerably more fidelity. Nevertheless, the anticipation also exists that the monomeric subunits will eventually find use as antigenic determinants in the construction of highly immunogenic protein complexes. References 77: 17 Russian, 60 Western.

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## EPIDEMIOLOGY

### YERSINIOSIS OUTBREAK FROM CONTAMINATED VEGETABLES

Moscow VOZDUSHNYY TRANSPORT in Russian 28 Oct 86 p 4

[Article by N. Krasun, physician-epidemiologist, Central Medical Epidemiological Unit, Medical Administration, USSR Ministry of Civil Aviation]

[Text] Incidents of an illness that is accompanied by high temperature, sore throat, skin rash, and indigestion were recorded in one of the civilian aviation directorates last year. The incidents were first observed among the youngest of the children in preschool institutions, but then similar incidents were noted among adults, too.

Raw vegetables were the cause of this illness. It is significant that they had been in storage for a period of time and that proper preservation procedures had not been followed. In addition, the storage spaces were found to house a large number of rodents, who had contaminated the vegetables. Thus, as a result of unsanitary storage, pathogens called yersinia multiplied and accumulated on the decomposing vegetables. And they caused an illness called yersiniosis.

Yersiniosis is an infectious disease that affects animals and humans. Its study was begun relatively recently. In our country, the first case of such an illness was recorded in 1968, in Moscow. Later, the pathogen was isolated in patients in other places as well. Now yersiniosis is being recorded in practically all areas of the country. The pathogen is widely found in nature, and illnesses are noted throughout the year, although primarily in the fall and winter.

Source of the infection for man is a yersiniosis-affected rodent who contaminates various objects in our environment and, most important, our foodstuffs. In addition to rodents, yersiniosis affects pigs, sheep, and cows, as a result of which milk and meat can become contaminated. Not only do the bacteria remain in contaminated products for a long time, they can multiply even in products under refrigeration.

The pathogen enters the human body through the gastrointestinal tract as well as through upper respiratory paths, which leads to a multiplicity of clinical

forms for the course of the disease. Susceptibility and morbidity are noted among all age groups, but they are especially high in infants and older children.

All forms of this disease are characterized by general symptoms: temperature elevation to 39 degrees, aching joints, stomach pain, indigestion, headache, and muscle aches. In infants, periods of limited improvement alternate with periods of worsening. In the very final stages, an allergic rash may appear.

Successful treatment of this disease depends first on timely initiation of physician's care. Treatment with home remedies, especially antibiotics, is absolutely unacceptable.

As a rule, the disease is found in collectives, where, when rules for sanitary preparation and storage of foods are broken, a multitude of people eat a contaminated dish. It also enters the home in this manner.

Prevention of yersiniosis is associated, first, with strict adherence to sanitary practices in storing and preparing food. Thus, before eating fruits and berries, one should wash them carefully under running tap water. Such care should also be taken with vegetables, especially when they are served raw.

Salads are best prepared right before serving. They should not be stored in a refrigerator for too long, and the refrigerator should be defrosted and cleaned once every two weeks. All products kept under refrigeration should be stored covered and separately. It is not acceptable to keep prepared-products or products that are not exposed to heat next to unwashed vegetables, greens, or fruits.

It is necessary to wash vegetables and greens carefully just before pickling or canning them. Following all of the simple rules of sanitation given above will protect each of us from the serious disease, yersiniosis.

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EXPERIMENTAL STUDIES ON REPRODUCTION OF KARSHI VIRUS (TOGAVIRIDAE,  
FLAVIVIRUS) IN SELECTED MOSQUITO AND TICK SPECIES

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 3, May 85  
(manuscript received 7 May 84) pp 231-236

[Article by N.V. Khutoretskaya, V.A. Aristova, S.G. Rogovaya\*,  
D.K. Lvov, S.K. Karimov\*, T.M. Skvortsova and N.G. Kondrashina, Institute  
of Virology imeni D.I. Ivanovskiy, USSR Academy of Medical Sciences,  
Moscow; \*Kazakh Institute of Epidemiology, Microbiology and Infectious  
Diseases, Alma-Ata]

[Abstract] A study was conducted to determine the host scope of the Karshi  
virus, strain Kaz-816, isolated in 1976 in the Alma-Ata Oblast from the  
tick *Hyalomma asiaticum*. Strain Kaz-816 was confirmed to reproduce in  
*H. asiaticum* as well as in the tick *Dermacentor daghestanicus*, and in the  
mosquitoes *Culex pipiens*, *Aedes aegypti*, and *Anopheles atroparvus*. In  
addition, feeding of infected *Aedes aegypti* on suckling albino mice resulted  
in virus transmission to the latter with clinical illness in 14 days. The  
virus was subsequently identified in the brains of the infected mice.  
Figures 2; references 10: 7 Russian, 3 Western.

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## GENETICS

### ATOMIC BOMB EFFECT ON GENETIC RESEARCH IN USSR

Moscow PRAVDA in Russian 4 Jan 87 p 3

[Article by R. Mikhaylov]

[Abstract] This lengthy article traces the career of Academician Nikolay Petrovich Dubinin on the occasion of his 80th birthday. Included within the article in a bordered box is an announcement of the awarding of the order of Lenin to Dubinin by the USSR Supreme Soviet, for his service in the advancement of biological science. Comments of Dubinin about events of his life and work are quoted in the article.

Dubinin said Soviet genetics blossomed in the 1920s, and for a time Soviet geneticists' ideas and experiments often stood above the work of their foreign colleagues, he said. This progress came to an end with the holding of, in Dubinin's words, "the notorious August 1948 session of the All-Union Academy of Agricultural Sciences, at which genetic science was proclaimed to be a 'false, metaphysical teaching.'"

After this event, according to the article, Dubinin left laboratory research and went to work as a field biologist. He studied birds that feed on insect pests, which was part of a forestation project along banks of the Ural River where it crosses the steppe. Dubinin's return to genetics research is described in the following excerpt from the article:

"But life's course returned to the necessity of advancing genetics research. The beginning of the age of the atom, for example, pointed directly to the urgency of such research. In 1956, N. Dubinin became head of the newly created laboratory of radiation genetics at the USSR Academy of Sciences' Institute of Biological Physics. A year later, it was decided to organize the Siberian Department of the USSR Academy of Sciences, and N. Dubinin became director of its Institute of Cytology and Genetics. In 1966 he became head of the USSR Academy of Sciences' Institute of General Genetics, which was created from the laboratory of radiation genetics in Moscow. Genetics research was pursued in full force, and not only in the scientific institutions that have been named. Present-day achievements of our scientists have returned Soviet genetics to the world level that had been lost.

"History teaches. It teaches, for example, how essential it is in science to observe a certain courteousness, a respect for facts, and tolerance of opinions. It is hard to make up the lost years. The gap of many years in the research, although it is long since past, is still making itself known: works of Soviet geneticists are on a level with world achievements, but they are not always in the forefront.

"N. Dubinin shared these thoughts: 'The events of 1948 broke the continuity of advancement of ideas in the schools of leading scientists that had been formed in the pre-war period of Soviet genetics. Even today we are being hindered by inadequate material support--instruments for research, fine chemical reagents. To a certain degree, this problem also stems from past years. Finally, if a comparison is made, for example, with the USA, we are lagging behind also in the number of scientists working on fundamental problems of our science.'"

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## HUMAN FACTORS

### WATER TRANSPORT RESEARCH INSTITUTE MODELING WORKING CONDITIONS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Jan 87 p 4

[Text] At the USSR Health Ministry's Scientific Research Institute of Water Transport Hygiene, one can dive to the ocean floor or make a voyage to the tropics or the Arctic without leaving the laboratory. Gale-force sea winds, intense heat and cold, pressures at depths of the ocean and many other phenomena are modeled here. Everyday working conditions of divers, seamen and fishermen have become a focus of research at the institute.

(A photograph shows institute associate A. Vasilyev adjusting apparatus mounted on the head of a test subject for recording reactions of the vascular system. Information readouts appear on a panel next to the apparatus.)

FTD/SNAP

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CSO: 1840/311-E

## IMMUNOLOGY

### WORK ON PEPTIDE PREPARATIONS FOR CORRECTING IMMUNE DEFICIENCY

Moscow IZVESTIYA in Russian 2 Jan 87 p 3

[Article by L. Ivchenko]

[Abstract] The article records a conversation with Doctor of Biological Sciences Avgusta Alekseyevna Mikhaylova, head of the laboratory of immune-system mediators at the USSR Ministry of Health's Institute of Immunology. Mikhaylova gave an account of a project aimed at development of immunity stimulators based on natural peptides. The director of this development was academician Rem Viktorovich Petrov, who is now director of the immunology institute.

Mikhaylova related that the project stemmed from discoveries which were made as early as 1969 in the laboratory that Petrov headed. In experiments with cultures obtained from mice, it was found that bone-marrow cells were capable of stimulating the production of antibodies by lymph-node cells when introduced into the latter, and that the stimulating effect was produced by peptides which the marrow cells secreted. These substances, which were given the name of myelopeptides, were the first immune-system mediator to be discovered in the USSR. Further experiments demonstrated that they were capable of correcting both congenital and artificially-induced immune deficiencies in animals, and that an immunity stimulator for human beings could be produced from animal myelopeptides.

Mikhaylova and her colleagues went on to develop such a preparation on the basis of substances obtained from the bone marrow of pigs. This preparation was given the working name "B-aktivin". It was subsequently renamed "miyelopid", in line with a proposal of the Pharmacology Committee, and it is now being successfully tested in 15 Soviet clinics.

Mikhaylova said that the preparation has proved effective in many conditions which give rise to immune deficiencies. It helps to prevent postoperative complications of complex surgery, for example. Myelopeptides have been found also to stimulate hematopoiesis, and development of a myelopeptide preparation which would have both an anesthetic and an immunity-stimulating effect is said to be in prospect. Further study of the chemical structure and amino-acid sequence of myelopeptides may make it possible to synthesize such compounds in large quantities, according to Petrov.

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## EFFECTS OF PLANT tRNA ON INTERFERON PRODUCTION

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 3, May 85

(manuscript received 3 Apr 84; in final form 17 Oct 84) pp 203-208

[Article by R. Zahorska, M. Korbecki\*, J. Barciszewski and U. Wojda, Sera and Vaccine Research Laboratory, Warsaw; \*Institute of Bioorganic Chemistry, Polish Academy of Sciences, Poznan, Poland]

[Abstract] A study was conducted on the effects of tRNA isolated from yellow lupine and wheat germ on the synthesis of interferon (IFN) in Lpa cell culture (L929 subline), in a system involving induction with 50 µg/ml poly I:C and 2000 µg/ml DEAE-dextran. The addition of 50 µg/ml initiating tRNA<sup>met</sup> during all stages of IFN production (inductive, synthetic, productive) extended the duration of IFN production from 8 to 24 h. Addition of 150 µg/ml of tRNA<sup>met</sup> during the stages of induction and synthesis led to complete inhibition of IFN production, while addition in the productive stage had a prolonging effect. Similar studies with unpurified tRNA showed that a dose of 50 µg/ml had the same effect as tRNA<sup>met</sup>. However, addition of 150 µg/ml of unpurified tRNA during induction led to 60% inhibition of IFN production. Its addition in the synthetic stage had no effect, and addition in the productive stage had a prolonging effect. The exact mechanism of action of tRNA remains to be elucidated, although its effects on mRNA-degrading enzymes and direct interaction with IFN have been previously implicated in explaining such phenomena. Figures 4; references 11 (Western).

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## STANDARDIZATION OF ELISA TO DETECT ANTIBODIES TO ORTHOPOXYVIRUSES

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 4, Jul 85

(manuscript received 19 Jul 84, revised manuscript received 17 Nov 84) pp 294-298

[Article by N.N. Maltseva, S.S. Marennikova, G.R. Matsevich, L.T. Stepanova and N.A. Khabakhpasheva, Moscow Scientific Research Institute of Virus Preparations, USSR Ministry of Health, Moscow]

[Abstract] A study of the effectiveness of use of the ELISA method to detect antibodies to orthopoxviruses used blood serum from persons ranging in age from 3-70 years, revaccinated against smallpox many times or having different histories of vaccination against smallpox and living in the Ivory Coast or the Congo. The tests showed that procedures used and calculation of results were not optimal for field conditions and did not reconfirm the previously indicated high sensitivity of the ELISA method. Factors which affect sensitivity and specificity of the ELISA reaction were discussed. Reliability of results depends to a large extent on the use of all necessary



checks, especially testing of each serum with a control antigen. This procedure is preferred to a unified assessment according to one normal (not containing antibodies) serum. Spectrophotometric registration of results and proper selection of optimum conditions of use of basic reagents increase the sensitivity of the ELISA reaction. Standardization of conditions of performing ELISA increases its sensitivity and reliability when used under field conditions. ELISA provides an equal or higher percent of positive results in comparison with the neutralization reaction. The advantages of the ELISA method justify its recommendation for use as a reliable method of serological study and as a test for species differentiation of antibodies. References 7: 1 Russian, 6 Western.

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CSO: 1840/185

#### HISTOLOGICAL CHANGES IN LIVER AND SPLEEN OF MICE EXPOSED TO VARIOUS ANTIGENIC PREPARATIONS OF COXIELLA BURNETII

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 5, Sep 85  
(manuscript received 2 Jan 85) pp 410-415

[Article by I.E. Kokorin, V.I. Pushkareva, J. Kazar and S. Schramek, Institute of Epidemiology and Microbiology imeni N.F. Gamaleya, USSR Academy of Medical Sciences, Moscow; Institute of Virology, Slovak Academy of Sciences, Bratislava]

[Abstract] Specific prophylactic measures against Q-fever are based on live attenuated, killed corpuscular and solubilized vaccines, all of which create a high level of immunity. In the present work, a comparative investigation was carried out on liver and spleen of mice (inbred line A) during intraperitoneal immunization with killed corpuscular and solubilized surface antigens of phase I of the Coxiella burnetii cells (Cb). These Cb cells were found to be highly toxic, as shown by the development of peritonitis and hepatosplenomegaly accompanying hyperplastic, degenerative and necrotic changes in liver. Changes in parenchyma were accompanied by diffuse and focal hyperplasia of the Kupfer cells and infiltration by lymphoid and plasmatic cells. The chloroform-methanol treated Cb cells in phase I and those extracted with trichloroacetic acid were non-toxic; no pathological changes were observed in internal organs of test animals. Figures 14; references 15: 2 Russian, 13 Western.

7813/9835  
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ULTRAVIOLET ABSORPTION PROFILE OF HUMAN LEUKOCYTE ULTRAFILTRATES AFTER  
AFFINITY CHROMATOGRAPHY ON IMMOBILIZED META-AMINOPHENYBORIC ACID: USE OF  
TRANSFER FACTOR FOR PURIFICATION

Bratislava ACTA VIROLOGICA in Russian Vol 29, No 2, Mar 85  
(manuscript received 3 May 84) pp 119-128

[Article by J. Borvak, Institute of Virology, Slovak Academy of Sciences,  
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[Abstract] A report is presented on the influence of affinity chromatography on the absorption ratio of 260/280 nm individual peaks obtained after penetrating chromatography of lysed human leukocyte ultrafiltrates (LLU) on sephadex G-15, and on the relationship among individual peaks of the material. Biospecific fractionation caused significant changes in 260/280 nm absorption ratios of individual peaks. Affinity chromatography caused an increase in the content of protein and purine/pyrimidine-bonded ribose in the material containing cis-diole groups which is thought to contain the functionally active transfer factor. Immobilized boric acid derivatives are found to be useful for extraction of compounds containing coplanar cis-diole groups from other component parts of LLU. Figures 3; references 38 (Western).

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NATURE OF MORPHOLOGICAL CHANGES IN RABBIT EYE MEMBRANE DURING TRANSSCLERAL LASER COAGULATION

Odessa OPTALMOLOGICHESKIY ZHURNAL in Russian No 6, 1986  
(manuscript received 4 Dec 85) pp 371-374

[Article by S.G. Legeza, physician; V.V. Vit, candidate of medical sciences]

[Text] In existence for more than 20 years, laser microsurgery has been used successfully in the treatment of a number of eye conditions: detachment and rupture of the retina, diabetic retinopathy, degeneration of the retina, retinoschisis, intraocular tumors, and, among others. As a rule, the laser's work is done through the pupil, which is dilated as much as possible, upon intraocular tissue and is controlled by an ophthalmoscope.

Going through the sclera to reach intraocular membranes with a laser is known as the transscleral method. Only a few reports exist in the literature on this method. In 1964, Campbell et al. suggested transscleral coagulation with a neodymium laser in retinal detachment. Attempts at using transscleral coagulation in primary and secondary glaucoma and retinoschisis have been made by a number of researchers [1-6]. Transscleral irradiation has been no more common than that for many reasons, the most important of which being the absence of sufficient data regarding the best method of achieving a coagulating effect and the paucity of studies on the nature of the changes that occur in the membranes and media of the eye after the use of such a method. This article deals specifically with those very questions.

The aim of this work was to study the nature and dynamics of the morphological changes brought about in the retinas of rabbits after transscleral irradiation with a neodymium laser and to identify the best ways of using the instrument to achieve a coagulating effect.

**Material and Methods.** The research was conducted on 70 rabbits (140 eyes) that were of the Flemish and Chinchilla breeds, were between 1.5 and 2 years old, and weighed an average of 2.5 kg.

Immediately before each experiment, the pupils of the rabbits' eyes were carefully dilated with repeated drops of a 1% solution of atropine sulfate.

Epibulbar anesthesia was carried out through the instillation of a 0.5% solution of dicain. The eye was dislocated from its orbit with a glass spatula and was kept in that position with a polyvinyl chloride frenulum 1.5 mm in diameter. During the experiment, the eye was irrigated with a physiological solution.

The irradiation was carried out with an experimental unit assembled on the base of a "Grif" neodymium laser with a energy range of 0.1-0.5 J (consequently, energy density in the radiation spot was equal to 80-400 J/cm<sup>2</sup>). The experimenters used a beam that was focused on the inner surface of the sclera by a collecting lens with a focal length of 60 mm.

The transscleral laser applications were in the region of the eye located between the limbus and equator. On the average, 7-10 applications were performed. The experimental animals were destroyed on a timetable by means of an injection into the auricular vein at 20 cm<sup>3</sup> of air.

For histological study, the eyes of the animals were removed either immediately after irradiation or after 6, 16, 24, or 30 days. Fixation of the enucleated eyes was accomplished in 10% neutral formalin. Histological preparations were made in the usual manner and were dyed with hematoxylin and eosin.

**Results of the Research.** The experiment established that transscleral laser irradiation of the sclera in the region between the limbus and the equator is attended by destructive changes in the vascular membrane, the pigmented epithelium, the ciliary body and the retinal membrane. The vascular membrane suffers the greatest injury, especially in those instances in which it is intensely pigmented as a result of the presence of a large quantity of stromal melanocytes. In similar instances, destructive changes are found even at energies equal to 0.2 J. Changes in the vascular membrane lead to destruction of the walls of the outer-layer blood vessels and subsequent hemorrhage into surrounding tissue (Figure 1. Note: figures 1 to 7 not reproduced.) The blood, especially right after coagulation, is hemolyzed as a result of the direct coagulating action that thermal energy has on erythrocytes. Microscopic study reveals a marked thickening of the vascular membrane as a result of the run off and the homogenization of stromal components. Far from the epicenter of the irradiation, the vascular membrane is thicker because of the pronounced plethora of the vessels.

At low energies (under 0.2 J), one can find only a pronounced plethora of the vessels in the uveal tract, and over a considerable length.

After several days, intense choroiditis and iridocyclitis develop, at which point the uveal tract is diffusely infiltrated with lymphocytes. Only in a small number of observations did not we detect a negligible admixture of segmented nuclear leukocytes.

With high-energy (0.5 J) transscleral laser irradiation, marked destructive changes of the stroma and the pigmented epithelium of the ciliary body are



found at the projection area of the ciliary body. The pigmented epithelium of the ciliary processes is peeled away and is located in the humor of the posterior and anterior chambers of the eye. In some of the observations, the pigmented epithelium of the ciliary processes was entirely absent (Figure 2). The blood vessels of the ciliary processes are expanded and overfilled with blood. Ruptures in their walls are visible, accompanied by hemorrhaging into the stroma. Five to six days after the irradiation, the destructive phenomena are joined by an inflammatory infiltration of the ciliary body, and signs of reactive proliferation of the surviving pigmented epitheliocytes appear. In a number of observations, we noted formation of large pseudocysts of the ciliary epithelium that have a basophilic content. The pseudocysts form as a result of the cleavage of two layers of the pigmented epithelium, with an afflux between them of pigmentless-epitheliocyte secretion products (Figure 3).

In confining the epicenter of the irradiation to the region of the flat part of the ciliary body and the vascular membrane, fairly intense destructive changes are found in the region of the pigmented epithelium of the retina that are characterized by destruction of the vitreous membrane and pigmented epitheliocytes, with individual cells or their fragments thrown into the subretinal space. When the vascular membrane is intensely pigmented, damage to the vitreous membrane and the pigmented epithelium is encountered considerably less frequently, which indicates a significant absorption of energy by the stromal melanocytes.

The changes most often found in the sensory part of the retinal membrane are the destruction of the bacillary and columnar layer and its slight detachment in the epicenter of the irradiation. An afflux of an eosinophilic homogenous mass is noted where the photoreceptor layer is damaged, whereas a fibrinogenic transudate with fragments of epitheliocytes and inflammatory cells is noted much later (Figs. 4, 5). It is important to note that even with marked damage to the photoreceptor layer, the other layers of the retinal membrane were practically unchanged.

In two observations, we identified more intense damage to the retinal membrane that was characterized by structural distortion of the layer of ganglion cells and nerve fibers. The layer of nerve fibers was thicker and numerous microcysts were found. Sometimes, total homogenization of the layer of nerve fibers set in, with an afflux of eosinophilic material.

Laser energies of high power (0.4 J) can lead to the formation of a coagulation focus of the retinal membrane that is practically indistinguishable from that which occurs in transpupil irradiation (Figure 6). The only difference--albeit a substantial one--between transpupil irradiation and transscleral irradiation is the marked damage to the vascular membrane as well as a tendency for the retina to detach at the site of the irradiation.

With laser radiation passing through the sclera at the sites of scleral vessels and nerves that are encased in a muff made of pigmented melanocytes, we detected destruction of the pigmented tissue as well as of the ciliary vessels and nerves.



In none of the observations following transscleral laser irradiation of eye tissue at various energy levels did we find appreciable changes of the scleral capsule. Destructive changes in the collagenous membranes were identified only in the internal layers of the sclera that are immediately adjacent to the pigmented vascular membrane. Besides being broken loose, the collagenous membranes were ruptured and small fragments were thrown in the direction of the vascular membrane (Figure 7). The scleral capsule remained intact along its remaining length. Insignificant changes were detected only in the episclera and led to plethora of the vessels, hemorrhage, disruption of the fibers of stromal elements, and inflammatory infiltration.

Our research showed that it is possible to achieve a coagulation effect in the inner membranes of the eye of the rabbit transsclerally with a neodymium laser. The level of energy needed to achieve the coagulation effect is in the range of 0.2-0.5 J. The feasibility of a coagulation effect also depends on the degree of pigmentation of the vascular membrane.

For the most part, the coagulating effect is achieved at the level of the vascular membrane and the pigmented epithelium of the retina. With irradiation of the projection area of the ciliary body, in spite of the considerable thickness of the tissues, it is possible to achieve a coagulating and destructive effect at the level of the pigmented epithelium of the ciliary processes. Secondary dystrophic changes of the ciliary epithelium arise as a result of the disruption of blood circulation that occurs because of damage to the vessels of the ciliary processes.

In conducting transscleral laser coagulation, it is possible to achieve coagulation of the retinal membrane, too, but the degree of pigmentation of the vascular membrane must be negligible and the energy level higher (0.3-0.5 J). A characteristic feature of transscleral laser irradiation of the retina is the preferred damage to the photoreceptor layer and the fairly high probability of slight detachment of the retina in the epicenter of the irradiation.

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## LASER TREATMENT WITHOUT ENDOSCOPES

Moscow TASS in Russian 26 Jan 87 0952 gmt

[Summary] Moscow, 26 January. Scientists of the Institute of General Physics of the USSR Academy of Sciences have developed an effective method of treatment and diagnosis using a laser beam for human internal organs without the source of radiation having to be administered within the body.

To demonstrate the new possibilities of the low intensity helium-neon laser traditionally used in medicine, Gurgen Askaryan, doctor of physical-mathematical sciences, switched on the device and pressed a glass light pipe, similar to a pencil against the palm of his hand. At this moment a red spot the size of a small coin lit up on the under side of his palm. The hand became almost transparent in this place with even the fine branches of blood vessels visible. Askaryan explains that such an effect can be obtained if the laser beam source is firmly pressed against the necessary surface area of the body.

Thus, it is possible to treat internal organs. To date in order to make use of the favorable effects of lasers in treating internal organs such as stomach ulcers it has been necessary to put the patient through the painful procedure of inserting endoscopes with a radiation source via the esophagus. From now on, it will be enough to select the necessary parameters for the work of the laser and press its radiator to the surface of the body opposite the internal organ requiring treatment.

Askaryan notes that research has confirmed that this use of lasers in treating the body is harmless, and the new method has already come into use in clinics in the Soviet Baltic Republics and at the Moscow Center of Surgery.

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## MEDICINE

### SAFE, PAINLESS ABORTION DEVICE

Minsk IZOBRAITATEL I RATSIONALIZATOR in Russian No 9, Sep 86 p 5

[Unattributed article: "Without Trauma and Without Pain"]

[Text] Despite bans by the church and secular officials, abortion has been widely practiced since time immemorial. The technology for interrupting a pregnancy has been refined, adjusted, and now, they say, perfected. However, even today, abortion--a painful operation--can lead to sterility and is sometimes life-endangering.

That is why the rare visitors to reach the booth hidden in a remote corner of the medical section of the exhibition of Leningrad innovators at the Exhibition of USSR National Economic Achievements read with interest the difficult-to-discern text that was printed directly on the chart:

"The magnetic cap displayed enables injury-free, painless interruption of the pregnancy in its early stages, with no instrumental entry into the cavity of the uterus and without the complications that arise from the surgical procedure associated with an artificially-induced abortion. After the destruction of the fertilized egg, the woman's normal menstrual cycle reestablishes itself.

When the endometrioid tissue is acted upon, its activity is suppressed and growth stops as a result of the disrupted functioning caused at the sub-cellular level by a magnetic field (Inventor's Certificate No. 888 983).

"The device can be used in gynecological practice. It was introduced at the public health unit of LOMO."

The inventors of the device are V.I. Gritsyuk, K.V. Bashmachnikov and Yu.S. Zatepyakin, staff members of the First Leningrad Medical Institute and the Institute of Obstetrics and Gynecology of the Academy of Medical Sciences of the USSR.

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CSO: 1840/096

## PREDICTING MYOCARDIAL INFARCTION

Minsk IZOBRAZITEL I RATSIONALIZATOR in Russian No 9, Sep 86, p 5

[Unattributed article under the "Medicine" rubric: "Thirty Years Before the Infarction"; first paragraph appears in boldface in the source]

[Text] A method, available to any physician, makes it possible to predict a myocardial infarction many years before it appears.

Can one tell, looking at a 10-year-old youngster beaming with health, whether or not the boy will have a myocardial infarction in 30 years?

We know that the arterial blood pressure in the left arm is different from that of the right. That is because the brachial arteries (on which blood pressure is measured) of the different arms have different lumens (that is, diameters). "A method of diagnosing a predisposition to ischemic heart disease" (Inventor's Certificate No. 1 156 633) is based on observations of this inequality of pressures. Candidate of Medical Sciences Yu. L. Anin--the creator of the method--got the idea when he was working at the Odessa Scientific Research Institute of Health Resort Treatment and Physical Therapy (now he manages the patent service in a branch of the Scientific Research Institute of Water Transport Hygiene).

The method is surprisingly simple. A cuff connected to an oscillograph (the same kind of cuff used to measure blood pressure) is placed alternately on each arm. The maximum amplitudes of the oscillograms are measured in millimeters. Then the percentage rates (A) of the internal lumens of the left and right brachial arteries is calculated. It is calculated from the formula.

$$A = (L \times 100) : R$$

where L is the maximum amplitude of oscillation of the left brachial artery, and R is the maximum amplitude of the right. Statistics show convincingly that if the lumen of a person's left brachial artery is 60-40% of the lumen of the right, that person should be registered immediately with the dispensary as having a high risk factor for ischemic heart disease.



"The experimental and clinical acceptance in the institutions of the Ministry of Health of the UkSSR," we read in the conclusion of the Ministry's Scientific Council, "enables us to conclude that the method makes possible the early identification of persons who have a genetic, congenital, high risk factor for ischemic disease in order that they may receive timely, early dispensary care (dispensarization) and that prophylactic measures may be taken. The simplicity of the method permits its use for massive examination of the population. We advise the use of the method."

The conclusion was reached in 1982. I have not come upon any clinics using the method. Its creator sent, free of charge, all the documentation to Leningrad, to the OKB of biological and medical cybernetics. One would hope that there the matter will go into hospital practice, since "no man is a prophet in his own country." Meanwhile, the method could help very much indeed in carrying out the party's decisions regarding universal dispensary care (dispensarization).

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## NEW DEVICE FOR HEART DISEASE DIAGNOSIS

Moscow TASS in Russian 19 Dec 86

[Summary] Kuybyshev, 19 December. An effective method for diagnosing heart disease has been developed at the city's Medical Institute. It now takes physicians just a few minutes to pinpoint the illness and even to predict the beginning of high blood pressure, insufficient blood supply to the heart and cardiac insufficiency. The "voice" of the heart is recorded on magnetic tape. L. Bukhvalova, an employee at the clinic's computer centre, explains: the "voice" of the heart sounds rather like the cheeping of a chick. It tells whether a heart is healthy and indicates signs of illness, obvious and latent. Physicians determine the problem after the tape has been deciphered by the computer. In many cases the new method is irreplaceable since with the use of an electrocardiogram some illnesses are not detected. The new diagnostic method, which includes a package of applied programs for the computer, which make it possible to analyze more than 140 parameters of the work of the heart, has been approved by the RSFSR Ministry of Health. Its introduction into Soviet medical practice, particularly polyclinics and medical stations at large enterprises, which have their own computer centers, will open up broad possibilities for mass screening of the population.

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CSO: 1840/262-E

DEVELOPMENTS FOR CRYOMEDICINE AT KHARKOV

Kiev PRAVDA UKRAINY in Russian 7 Jan 87 p 4

[Article by Yu. Fedotov]

[Excerpt] Is cold--that is, deep cold, when the temperature drops to minus 100 degrees Celsius--our ally or our enemy? This question is answered by a theme exhibit which is now in the "Science" pavilion at the Exhibition of National Economic Achievements of the Ukrainian SSR. Highly interesting work by institutes of that republic is being shown.

In our country and abroad, methods for the long-term storage of organs and tissues are under intense study. At the Ukrainian Academy of Sciences' Khar'kov Institute of Problems of Cryobiology and Cryomedicine, methods have been developed for the low-temperature storage of skin, corneas, thyroid glands and pancreases, blood vessels and aortic valves, blood cells, and other organs and tissues. The institute has a special design-and-technological bureau and an experimental plant which are developing and building equipment for cryoconservation, and instruments for cryosurgery. The products shown at the exhibit include the "KLTKH-500" freezer, in which biological materials for transplantation can be preserved for a long time at temperatures ranging from minus 5 to minus 90 degrees Celsius.

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PATHOGENESIS OF GUNSHOT WOUNDS AND PRINCIPLES OF THEIR SURGICAL TREATMENT

Moscow KHIRURGIYA in Russian No 6, 1986 (manuscript received 19 Jul 85)  
pp 7-13

[Article by Professor Yu. G. Shaposhnikov and Candidate of Medical Sciences B. Ya. Rudakov, Central Traumatology and Orthopedics Institute imeni N. N. Priorov (Director, Professor Yu. G. Shaposhnikov), Moscow]

[Text] As has been demonstrated by the performance of surgical procedures in the course of postwar local conflicts and accidental gunshot wounds, the treatment of wounds continues to be a pressing problem. In addition to complex organizational problems, the specific characteristics of firearms injuries are of considerable importance.

The pathogenesis of a gunshot wound is largely determined by the many ways in which the penetrating projectile affects the tissues, organs, and the body as a whole. A wound constitutes the starting torque of pathological processes that take place on a cellular, tissue, organ, and system level. Only part of these changes occur immediately after the injury, while the rest are manifested gradually, each with its own developmental dynamics and influence on the morphology of the gunshot wound and the subsequent course of the repair processes.

Recent studies conducted in our country and abroad indicate that in addition to the projectiles' mechanical impact that leads to the destruction of tissue structures, complex physical-chemical and biological processes are initiated that significantly determine the functional state of tissues peripheral to the injury canal and the characteristics of subsequent compensatory processes.

The degree to which local and general changes occur in gunshot wounds is determined, first of all, by the ballistic characteristics of the projectiles (weight, caliber, flight speed and stability, magnitude of kinetic energy, and manufacture material).

Included among the various ballistic characteristics that affect the gravity of wounds are the airborne speed and stability of the projectile, and what is particularly important, the bullet's speed and stability as it moves in the tissues.

A high initial flight speed is characteristic of modern bullets, i.e., in the order of 800 to 1,000 meters per second for 4.32 -- 5.56 caliber rifle bullets, and over 1,000 meters per second for shell fragments. The initial flight speed of traditional 9 mm caliber revolver bullets is about 350 meters/second.

An important distinctive feature of modern projectiles is their relatively low flight stability. The design features of small-caliber bullets are such that their airborne flight is at "maximum" stability, so that once they enter the tissue they quickly lose that stability, deviate from their flight trajectory, and often take up a transverse position. In such cases the drag on the bullet is markedly increased and the amount of energy transmitted to the tissues is correspondingly increased. It is for this reason that the gravity of wounds inflicted by high-speed small-caliber bullets, particularly when fired from a distance of 50 -- 100 meters, can be greater than injuries caused by larger caliber bullets with greater kinetic energy, but greater flight stability. In perforating wounds they retain a significant portion of energy whereas small-caliber bullets can lose more than 50 percent of their kinetic energy.

At the same time, the injurious action of a large-caliber bullet is retained over a significantly longer distance than is the case with small-caliber bullets, and if flight stability is disturbed, for example, if the bullet pierces a light obstacle, the injurious effect can be considerable.

The relatively small size of the destructive elements, high flight speed, and low spatial stability contribute to the specific manner in which energy is transmitted from the penetrating shell to tissues and organs, and which constitutes the essence of firearms wounds.

In the case of injuries caused by non-firearms weapons (knives, axes, etc.) the impact energy is relatively small and is expended on the penetrating action and tissue damage only in the wound canal zone. In gunshot wounds kinetic energy is expended along the path of the penetrating shell and radially outward from the wound canal.

The faster the speed of the penetrating shell, the shorter is the time interval in which energy is transmitted. In the case of high-speed projectiles, energy is generally transmitted within several milliseconds. This leads to the formation of a temporary pulsating cavity that is dozens of times larger than the penetrating shell. Within the time period of the temporary pulsating cavity's existence (tens of milliseconds) there is significant displacement of tissues in the wound region, penetration of wound detritus, splintered bone, shell fragments, and microorganisms far beyond what can be seen upon examination of the wound canal.



Another characteristic feature of contemporary projectiles is that they frequently shatter and become warped as they move through tissue. This increases the gravity of tissue injury both in the wound zone and outside of the projection of the principal wound canal due to individual fragments.

The shifting movement of the penetrating shell in the tissues leads to a significant primary deviation of the wound canal, and the displacement of tissues at the time of the temporary pulsating cavity's existence causes a secondary deviation which significantly complicates the gunshot wound's structure and variegation of tissue displacement with variable degrees of tissue injury and viability.

The non-uniform transmission of energy along the path of the wound canal has a significant influence on the formation of a gunshot wound.

In wounds caused by shells that travel at low speed and move steadily through tissues, such as revolver bullets, the bullet energy is transmitted relatively evenly along the path of the wound canal so that tissue damage, displacement, and the size of the entry and exit holes are relatively small.

The nature of energy transmission and tissue damage is quite different in wounds caused by high-speed and highly unstable penetrating elements. When perforating wounds are caused by these types of shells, the greatest amount of transmitted energy will be within the core of the wound or close to the exit hole respectively, and the gravity and extent of tissue damage will increase in these zones.

In the case of stable bullet flight, the wound canal will take a relatively narrow linear path and tissue damage along that path will be rather uniform. The mass ratio of excised non-viable tissue in the first and second half of the wound (from entry to exit) will be 1:3 [5]. Experimentally, wounds inflicted by high-speed bullets with unstable flight, as a rule, are grave and involve frequent fractures. Although the wounds were inflicted only on soft tissues, the ratio of tissue excision in the first and second half of the wound was 1:8, but the total mass of removed tissue was several times greater than in wounds caused by slower-traveling bullets with a stable flight pattern.

The characteristics of wounds caused by fragments are considerable. Fragments, as a rule, are less stable than bullets and travel at a high speed so that in the course of inflicting wounds they give off their total energy, thereby forming blind wounds that lead to considerable tissue defects. Multiple wounds are characteristic of fragmentation injuries, although the gravity of the tissue damage can be variable. In addition, fragmentation wounds are often combined with inner injuries caused by the shock wave of ammunition explosion.

The characteristics of energy transfer by projectiles to tissues (large amount, short-term, pulse, uneven) largely determine the pathogenic mechanisms that take part in the formation of a gunshot wound and the body's response.

The direct action of projectiles leads to the mechanization destruction of tissues and their complete loss of viability. Additional tissue trauma occurs within the period of the temporary pulsating cavity's function which results in tissue rupture and cleavage, variable degrees of vascular damage, hemorrhage, and tissue imbibition of blood. The end result of the penetrating shell's mechanical action is essentially the wound canal which contains wound detritus and dead foreign bodies and tissues that comprise the walls of the wound canal, i.e., everything that must be removed in the surgical treatment of a wound. Without doubt, the gravity and extent of tissue damage depends on the location of the injury and the topographical-anatomical interrelationships between tissues of various physical characteristics, their capability of displacement, distension, degree of fixation, water or gas content, and blood engorgement.

Increasing attention has been recently given to an evaluation of the condition of tissue along the periphery of the wound canal, where tissue viability is diminished (molecular concussion or commotio zone). The pathological and compensatory processes in this zone of a gunshot wound are quite unique and can lead both to the restoration of viability as well as to an exacerbation of functional and morphological changes, the development of a secondary necrosis nucleus, and frequently, suppuration.

The penetrating shell's uneven transmission of energy not only leads to irregular tissue damage, but also to variable degrees of tissue dysfunction which makes it difficult to delineate the viable tissue borders during surgical treatment.

The transformation of transmitted energy in the tissues proceeds by several paths, including intracellular disruption of redox processes, mitochondrial and cell membrane function, energy supply and protein synthesis.

Studies by B. Janzon [2], S. Tikka, and coauthors [6], P. Hasselgren and coauthors [1] demonstrated that there was a reduction in enzyme activity, reduced ATP and creatine phosphate content, lactic acid accumulation, and a 30 percent reduction in protein synthesis capability that took place at a distance of from four to ten centimeters from the wound canal in pigs with soft tissue wounds of the extremities.

If the process takes a favorable course these changes can be reversible. However, they could go the other way as well.

A direct relationship was demonstrated between the amount of energy transmitted to the tissues and the functional state of the tissues around the wound canal, metabolic disturbances, microcirculation, and the magnitude of the intracellular potential.

Microcirculation disturbances in tissues with lowered viability is one more important pathogenic factor that determines the degree and extent of changes that take place in the tissues. Cases of increased vascular permeability and tissue edema in the gunshot wound region are described in the studies by J. Larsson and coauthors [3] and demonstrate that the extent to which tissue electrolyte balance and intra- and extra-cellular fluid distribution are disrupted is directly dependent upon the ballistic characteristics of the projectiles, and particularly upon the amount of energy they transmit. The development of muscle tissue edema in fascia sheaths is a particularly unfavorable factor and may lead to a significantly larger area of nonviable tissues.

The considerable hemorrhage that is concomitant with serious wounds to an even greater degree contributes to the deterioration of microcirculation, the development of hypoxia, and an exacerbation of metabolic disturbances which in turn result in a disruption of intracellular metabolic processes.

Dysfunction of many regulatory organs and systems has been observed in serious gunshot wounds. T. Orlovski and coauthors [4], in an experimental study of an organism's response to soft tissue gunshot wounds, noted a significant increase in blood epinephrine and norepinephrine levels, a reduction of arterial and venous pressure, and the development of acidosis immediately following the wound. The extent of these disturbances was directly proportional to the gravity of the wounds and the attendant hemorrhage.

Disturbances of ANS and CNS regulatory function in serious gunshot wounds are well recognized. One of the factors indicative of such dysfunction is the great frequency of shock, particularly in cases of extensive soft tissue damage, gunshot fractures, and cavity-penetrating wounds.

All of these local, regional, or general type changes have a direct bearing on the development of processes that limit the tissue damage zone in the area of the gunshot wound. However, in an unfavorable turn of events they can lead to the formation of secondary necrosis foci and zones. Since these processes evolve over a specific time period, therapeutic compensatory measures may be undertaken.

Thus, the gravity of gunshot wounds and the subsequent changes that take place in the tissues peripheral to the wound canal and in the entire

organism as a whole, is determined by a set of factors that include the penetrating elements' ballistic characteristics, the type of energy transmission and transformation in the tissues, the anatomical tissue interrelationships in the wound region, and the functional condition of vitally important organs and systems.

The variety of gunshot wounds can be extremely large, ranging from shallow soft tissue wounds that do not require surgical treatment, to multiple serious wounds resulting from explosive devices that require a decision as to the sequence of surgical intervention to be undertaken, and the application of resuscitation measures.

Firearms wounds that are inflicted by contemporary projectiles are characterized by the following features: Complex path and structure of the wound canal, irregular pattern of tissue damage along and peripheral to the wound canal, formation of significant non-compensatory tissue defects, particularly bone defects, extensive zone of tissue with lowered viability around the wound canal, combined damage to organs and tissues from different anatomical regions, combination of open visible wounds and hidden injuries, and the pronounced general impact upon the whole organism.

The basis for rendering assistance to wounded persons consists of the principles elaborated by military field surgeons during the period of the Great Fatherland War of 1941 — 1945. It is generally recognized that not all gunshot wounds require surgical treatment. Surgical treatment is not indicated in perforating soft tissue wounds of the extremities or the torso without damage to the bones and neurovascular trunk, where there is no significant hemorrhage or extensive hematomas or penetration into cavities. However, in these types of wounds it is essential to apply dressings, to keep the victim quiet, to administer analgesics, and to undertake symptomatic treatment and observation since one can never rule out the probability of suppurative complications in such cases. At the same time, if surgical treatment is given to all such wounded persons, the number of suppurative complications, particularly during suturing, will increase markedly.

When indicated, primary surgical treatment with full resuscitation and anesthesiological support, must be undertaken as quickly as possible after the injury.

The absence of an anesthesiologist or resuscitation specialist must not delay essential surgical intervention. In such cases, surgery is accompanied by the A. V. Vishnevskiy method of intubation or infiltration anesthesia.

In view of the increased gravity of wounds, the quality of first aid takes on special significance. All of the therapeutic measures taken must first of all be directed toward the prevention of shock, the prevention of suppurative complications, and rapid compensation for disturbances of respiratory and circulatory functions. Therefore, first-aid procedures



must provide for reliable immobilization in the case of fractures and extensive injury of the extremities, the application of dressings, the administration of analgesics, the start of infusion therapy to replenish blood volume through the use of high molecular-weight dextrans, anti-shock fluids, and the most suitable physiological position for transporting the victim.

The evaluation of wound and injury gravity, and a determination of the most severe damage in the case of combined wounds, plays an important role in the process of selecting therapeutic tactics. With this purpose in mind it is essential to examine the entire victim and to remember that there may be hidden injuries of the brain, organs in the thoracic and abdominal cavities, and wounds in the retroperitoneal space. In the case of severe wounds, measures to refine the diagnosis must be undertaken at the same as resuscitation procedures.

An important step in the surgical treatment of gunshot wounds is a rational selection of access that takes into consideration the location of the wound, the size of the injured tissue, and the extent of intended intervention. In the case of perforating or multiple wounds, surgical treatment must be begun with the wound which is assumed to contain the greatest mass of damaged tissue. In the case of extensive shin, forearm, and shoulder bone damage, oblique transverse incisions are possible. This will permit good access to various groups of muscles, reliable drainage, and juxtaposition of tissues following surgical treatment and subsequent reconstructive-restorative operations.

Dissection of a gunshot wound must not only provide free access to all of its parts, evacuation of hematomas, and exposure of wound pockets, but also free drainage for the wound discharge.

Particular attention must be given to the need for a broad dissection of all fascia sheaths along the path of the wound canal, inasmuch as the compression of tissues in the sheaths can lead to a significant increase in muscle damage and the disruption of regional circulation. Wound defects in the fascia, as a rule, are much less than in damaged muscles within the fascia space, particularly at the core of the wound.

In performing the second step of treating a gunshot wound, i.e., excision of tissues, it is essential that attention be given to judicious excision of skin. Only absolutely non-viable tissue is excised during the primary surgical procedure. The excision of unjustifiably enlarged segments of tissue does not improve the quality of treatment or its outcome. Practice has shown that experienced surgeons excise less tissue in the treatment of gunshot wounds than do surgeons who are less acquainted with problems of military field surgery.

Obligatory elements of full-fledged surgical treatment of wounds include copious irrigation of the wound with an antiseptic solution, injection of from 400 to 800 ml of a 0.25% novocaine solution into the soft tissues,



thorough hemostasis without excessive ligature, removal of foreign bodies and small bone fragments that have become loosened from the periosteum, and smoothing down broken off pieces of bone.

Extreme caution should be exercised with respect to expanding the scope of intervention for the purpose of "radical" surgical treatment and a one-time shot at undertaking an exhaustive treatment of a gunshot wound. The development of pathological processes in tissues over the course of time, which is particularly pronounced in severe wounds, makes such attempts ill advised, and in a number of cases, they could be dangerous.

The application of sutures to the skin following surgical treatment is inadmissible. At the same time, every possible effort must be made for the subsequent closure of the wound. Secondary surgical treatment, up to the point of the development of suppurative complications, may be undertaken for that purpose when the patient's condition becomes stabilized. In the course of the secondary surgical treatment, additional excisions of identified non-viable tissue are made, and drainage conditions are improved. As the edema diminishes, the wounds can be constantly irrigated with antiseptics and broad spectrum antibiotics. In the event of a temporary shunting of major arteries, final restoration of major blood flow can be undertaken.

However, not all non-viable tissue can always be removed during secondary surgical treatment when the wound canal has a complex configuration and when there are large segments of damaged tissues. In such cases effective use can be made of proteolytic enzymes, preferably immobilized on a tissue or collagen base. The use of adsorbents that enhance the removal of wound discharge is quite advisable.

The patient must be immobilized when wounds involve the extremities. Preference should be given to external fixation methods, and above all to a plaster bandage. Various reconstructive-restorative procedures to restore the support function of the extremity may be performed when tissue viability in the wound area has been fully restored and when compensation has been achieved for anemia, hypoxia, and hypoproteinemia.

Although surgical treatment of wounds is still the primary medical procedure, the effect that general factors have on wound adhesion and the prevention of infection and its control has been playing an increasing role.

Whereas it is exceedingly important to supply circulating blood volume in the first hours after a wound, it is no less important to compensate for anemia by the transfusion of fresh blood, and hypoproteinemia by the systematic administration of protein preparations, preferably amino acid

mixtures. Water-electrolyte disturbances, metabolic acidosis, and hypoxia must be counterbalanced in the early hours. Hypoxemia and circulatory hypoxia should be quickly and effectively counterbalanced by HBO. Besides, HBO acts upon the microflora of wounds to a certain degree and provides for a more favorable course of the reparative processes.

The normalization of metabolic processes is significantly influenced by preparations that provide the energy requirements of cells and those that normalize membrane function. These primarily include the B vitamins, cocarboxylase, and vitamins C, E, and A that exhibit antioxidant activity, ATP, phosphadene, and other biologically active substances that affect the normalization of metabolic processes.

Finally, effective antibacterial therapy is an important factor in the healing of gunshot wounds. This entails the use of antibiotics, antiseptics, non-specific treatment such as ultraviolet irradiation, and various methods of physiotherapy.

Only a comprehensive approach to the treatment of wounded persons can accomplish good results, reduce the number of suppurative complications, and reduce the period of disability.

#### Conclusions

1. The damaging effect of contemporary firearm projectiles (bullets, fragments, arrow-like and other injurious elements) is determined by a group of factors, particularly by their ballistic properties, the nature of energy transmission and transformation, location of wound, and the anatomical and topographic characteristics of the wound area's structure.
2. The structural complexity of a gunshot wound is determined both at the moment of the penetrating shell's action as well as the subsequent variable intracellular, circulatory, and regulatory disturbances that take place in response to the action of the projectile.
3. The treatment of severe gunshot wounds can be successful only if the surgical treatment is optimal in substance and scope, the local treatment of the wound is adequate, and the overall treatment rendered to the victim is rational.

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SURGICAL DRAINS MADE FROM POLYMER FILM

Moscow KHIRURGIYA in Russian No 7, 1986 (manuscript received 5 Jan 85)  
pp 127-129

[Article by Professor Yu. G. Shaposhnikov, Director, Central Traumatology and Orthopedics Institute, Moscow]

[Text] The outcome of many operations depends on how effectively surgical wounds are drained in the postoperative period. The quality of drainage is particularly important in emergency procedures involving diseases of abdominal cavity organs, open wounds, fractures with soft tissue destruction, and operations in which there are large traumatized surface areas.

The principal difficulties encountered in improving drainage devices are related to increasing drainage effect and absorbability, reducing traumatic action, and a simplified way of manufacturing such devices.

There has been considerable recent success in making effective drainage devices that are essential to removing discharges from a wound.

Polymer tubes, including dual-opening tubes, for vacuum drainage and simultaneous irrigation of wounds, are well known.

Elastic tubes made out of a hydrophobic polymer material have been patented in England (Patent No. 1525387, 1978). There are also surgical drainage devices that constitute a series of tubes (canals) that are placed at various levels in an elastic hydrophobic matrix. The tubes and matrix are usually made of an organosilicon latex (USA Patent No. 3860008, January 14, 1975).

The disadvantages of these types of drains include their relatively low degree of effectiveness because the matrix does not take part in the drainage process, the rather difficult process of manufacturing the drains, canal obstruction by discharge clots, and the necessity of connecting a supplemental suction device.

In recent years we have been widely using a drain made out of a cellulose hydrate film that is employed for dialysis membranes in an artificial kidney apparatus. The film is folded into a flat sheet which is formed into triangular canals (see diagram). This kind of drain is easily

inserted into a wound at any depth. As the film is inserted its surface engages the discharge and becomes more elastic. This makes it easy for the drain to duplicate the contour of the wound canal. Because of the capillary force that emerges between the adjacent surfaces of the film, the discharge accumulating in the wound is continuously expressed outward through the drain canals. Inasmuch as the total surface area of the drain is rather large (300 -- 1000 cm<sup>2</sup>), its obstruction by wound discharge elements is practically excluded.

It has been experimentally established that optimal results are obtained when the embossed film has 10 -- 15 sheets with a total rib length of 0.5 -- 1.5 cm. Film thickness is 10 -- 50 microns. A positive feature of the drain is that it can be removed at any time after surgery with a minimum of trauma.

After experimental testing, the embossed drain was used in clinical practice for the purpose of draining postoperative wounds in more than 350 patients. The drain was found to be highly absorbent, thereby creating optimal conditions for wound discharge drainage. This enhances a better regeneration of tissues and contributes to fewer postoperative complications. No small advantage of the proposed drain device is its simplicity of manufacture.

The embossed drain was successfully used in operations for diffuse and nodular goiter. In this case a drain with a 5 -- 8 mm sheet width and 8 -- 10 sheets for 48 hours are highly recommended. We used this drainage device in 21 patients and obtained primary wound adhesion in all cases.

The embossed drain obviates the need for tubes and vacuum drainage in radical mastectomies. In such cases, two drains should be used. One into the axillary space, and one onto the lower angle of the incision. The width of the plane is 10 -- 12 mm, and the drain length is 30 cm. After 72 hours the exudate discharge stops and the drain is removed. Evacuation of the wound discharge must be undertaken most intensively in the first hours after surgery. No additional punctures were required in any of the 15 radical mastectomy patients for the purpose of removing accumulated wound secretion, and the wounds healed by primary adhesion.

The embossed drain can be convenient in the surgical treatment of extensive trauma soft tissue injuries with integument or subcutaneous tissue detachment. The wounds should be drained by two, and sometimes three, drainages for a period of up to 72 hours.

We used a drain consisting of 15 sheets 1.5 cm in width in 34 patients following cholecystectomies. In these cases the drainage can be retained for more than three days. The drain is connected to the bed of the gall bladder and retains its effectiveness for the entire time that it is in place.



The embossed drain is completely suitable for post-gastrectomy use, in which case it is connected to the region of the esophageal-gastric anastomosis through a puncture in the abdominal wall in the left hypochondrium. Following a gastric resection, we fed a drain through another puncture in the abdominal wall in the right hypochondrium to the duodenal pouch by performing a Bilrot II operation, and to the gastroduodenal anastomosis by a Bilrot I operation.

We are presently making wide use of the embossed drain in operations on the colon by placing it in the retroperitoneal space, in nephrectomies, and in extirpation of the rectum, by permanently closing the perineal wound and without using vacuum drainage.

The embossed drain offers good results in uterine extirpation and supravaginal amputation. It is particularly indicated in plastic closure of large postoperative hernias.

#### Conclusions

1. A surgical drain made of a cellulose hydrate film, embossed, and then folded into a flat sheet offers positive results, i.e., effective drainage of various kinds of wounds and cavities without the use of suction devices.
2. Because of the drain's large surface, high degree of wettability, and capillary effect, it gives good results with minimum trauma to surrounding tissues without excessive diastasis of wound margins.
3. Cellulose hydrate film approved by the USSR Ministry of Health for use in the medical and food industry should be used to make surgical drains.

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## NON-IONIZING ELECTROMAGNETIC RADIATION

### EFFECTS OF LOW-INTENSITY MONOCHROMATIC ELECTROMAGNETIC MILLIMETER WAVES ON BIOLOGICAL PROCESSES

Moscow BIOFIZIKA in Russian Vol 31, No 1, Jan-Feb 86 (manuscript received 15 Feb 85) pp 139-147

[Article by M.B. Golant]

[Abstract] Soviet and Western literature was reviewed to provide an update on the effects of monochromatic millimeter waves of non-thermal intensity on biological processes. A survey of the research results demonstrated that various organisms and systems are responsive only to narrow frequency bands and oblivious to higher or lower frequencies, and that there is considerable individuality in responsiveness. The fundamental conclusion is that millimeter waves act either to enhance or attenuate information signals in the various systems, through interaction with the electromagnetic fields of living systems. The basic mechanism, then, involves coherent excitation in biological systems. Recent advances have dealt with the potential application of such radiation in medicine. References 31: 19 Russian, 12 Western.

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### PHYSICAL MODELING OF ACOUSTIC BIOEFFECTS OF SHF

Moscow BIOFIZIKA in Russian Vol 30, No 5, Sep-Oct 85  
(manuscript received 5 Mar 84) pp 894-899

[Article by R.E. Tigranyan and V.V. Shorokhov, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] A physical model was tested for suitability in analyzing the bioeffects of SHF impulses, using as the test objects 1 M NaCl and ethanol. The experimental data demonstrated that the closed volume of the liquids may be regarded as an acoustic resonator with an inherent frequency of oscillation. The absorbed SHF energy is transformed into mechanical energy of the target liquid. Oscillogram recordings of the mechanical oscillations in the liquids were subject to quenching as a result of interference. The

parallel recordings of both acoustic and visual signals demonstrated that both effects of the radiowaves were due to transformation of the SHF energy into mechanical energy of the absorbing liquid. The data demonstrated that as a result of interference of succeeding maxima (or minima) resonance frequencies for the liquid columns can be determined, since they behave as quarter-wave resonators. Figures 8; references 10: 1 Russian, 9 Western.

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#### REDUCTION OF FERRICYANIDE BY SHF ELECTROMAGNETIC FIELDS IN HUMAN ERYTHROCYTE/METHYLENE BLUE SYSTEM

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(manuscript received 3 Jul 84; in final form 3 Dec 84) pp 911-915

[Article by V.P. Tsybyshev, V.M. Shtemler and A.N. Kuznetsov, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] To further expand the knowledge base of SHF effects on biological systems, the effects of SHF ( $1000 \pm 10$  MHz; 220-580 mW/g) were assessed in terms of ferricyanide reduction in human erythrocytes in a system including methylene blue. The study was conducted over a temperature range of 23-34°C, using preserved human blood stored at 4°C for up to 21 days. Over the temperature range in question, the kinetic plots revealed three distinct areas with apparent energies of activation of 30-130 kJ/mole. The three regions were separated by two narrow 'anomalous' regions with zero or negative energies of activation (0 to -70 kJ/mole), occurring at 26.0-26.8°C and at 29.0-30.5°C. The latter type of temperature bands ranged from 0.4 to 1.8°C, depending on the donor and directly on the duration of storage. The effects of SHF irradiation were to increase the rate of reduction by 15 to 30%, with positive correlation coefficients ( $r = 0.84$  and  $0.80$ , respectively) vis-a-vis temperature band width and duration of storage. The effects of SHF, apparent only in the narrow bands, preclude a generalized thermal effect and implicate selective transmembranous transport processes in rate enhancement. Figures 2; references 9: 1 Polish (in Eng.), 3 Russian, 5 Western.

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**EFFECT OF PHARMACOLOGICAL AGENTS FOR PREVENTING MOTION SICKNESS ON  
CARDIOVASCULAR SYSTEM**

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 49, No 3, May-Jun 86  
(manuscript received 20 Dec 84) pp 90-95

[Article by S. L. Ilina, V. V. Sabayev, Z. S. Shashkov and S. K. Karsanova,  
USSR Ministry of Health Institute of Medical-Biological Problems, Moscow:  
"The Effect of Pharmacological Agents to Prevent Motion Sickness Syndrome on  
the Cardiovascular System in Modeling the Early Period of Adaptation to  
Weightlessness"]

[Text] In the early period of human adaptation to weightlessness (EPAW), functional changes of the cardiovascular system occur (2, 3, 5). They are expressed in the redistribution of blood and bodily fluids in a cranial direction, which manifests itself as a feeling of blood congestion and heaviness in the head, blockage of the nasal cavities, puffiness in the face, sclerotic hyperemia, increased blood in the veins in the neck and higher pressure in them (3). During the same period, a state develops which is similar to the complex of symptoms of motion sickness (MS). It manifests itself in approximately every other or every third astronaut and is expressed in dizziness, worsened overall state of health, hypersalivation, nausea, and in a number of cases vomiting as well (2, 12). According to the subjective evaluations of American astronauts, the use of pharmacological compounds (scopolamine, scopolamine with dexedrine) for prevention and treatment improved overall condition (4).

In this connection, a hypothesis was advanced according to which hemodynamic shifts in the body in EPAW play an important role in the pathogenesis of MS (1).

Observations made on earth testify that MS develops more rapidly and more intensely in people who suffer from arterial hypotension. This also reduces the effectiveness of preventive medicines for MS (11).

Taking into account the absence of information on the effect of preventive medicines for MS on the cardiovascular system and the supply of blood to the brain, we carried out research aimed at elucidating the reaction of the human cardiovascular system in modeling EPAW under the conditions of earth and in taking preventive medicines for MS.

## Methods of the Study

Tests were participated in by 16 individuals from 25 to 45 years of age who had undergone expert evaluation of their state of health. Repeat participation in the studies was permitted after 10-14 days. As a model of EPAW, we used 6-hour periods of exposure to antiorthostasis with an angle of inclination of the cranial part of the body of  $-15^{\circ}$  (6). The functional state of the cardiovascular system was judged according to clinical indicators of subjective state and changes in the frequency of cardiac contraction and arterial pressure. Complex study of the contractile function of the myocardium and of the intracardiac, central, and regional hemodynamics, was carried out by methods of electrocardiography (multichannel Elkar-6 electrocardiograph, 12 standard leads), exocardiography (the Echoview exocardiograph from the Picker Corporation, United States, using a monocrystal sensor with a frequency of 2.25 megahertz) and rheoencephalography (the Soviet 4 RG-IA rheograph, with graphic recording of rheograms on an 8-channel electroencephalograph of the Galileo firm (Italy)). Analysis of the rheograms was carried out using generally accepted methods (15). The preventive drugs for MS used were scopolamine (0.001 g), ephedrine (0.025 g), phencarol (0.05 g), pipolphen (0.025 g), and combinations of ephedrine with pipolphen and scopolamine in the indicated doses. Complex study of the functioning of the cardiovascular system included the use of a "double blind" control during the background period after 1, 3, and 6 hours of antiorthostasis, and in the recovery period (15 minutes and 1 day after antiorthostasis). The drugs were taken internally in the form of capsules 15-30 minutes before the experimental subjects went into antiorthostasis. The results obtained were processed by analysis of variants using the Student-Fisher criterion.

## Results and Discussion

The overall state of health of the experimental subjects during the time of the control background studies in a klinostatic position while taking a placebo (lactose, 0.25 g) and pharmacological substances over the course of the entire period of observation (6 hours) was assessed as satisfactory. During the first 3 hours of antiorthostasis, all of the experimental subjects experienced symptoms characteristic for antiorthostasis: a feeling of heaviness in the head, blockage of nasal cavities, hyperemia of the face and neck region. By the third hour, complaints of sleepiness and cold in the distal portions of the legs were added to these. Some of the experimental subjects experienced an illusory sensation of their body turning head first, a feeling of swinging or falling. The degree to which these symptoms were expressed decreased as the period of antiorthostasis increased. The passive orthostatic tests done during the background period were accompanied by a sensation of blood draining from the head and flowing toward the feet, along with a sensation of warming up. During antiorthostasis, bradycardia was observed in all the subjects. Contractions of the heart became 15-10 percent more infrequent during the course of the entire period of antiorthostasis (control studies). On the EKG, the final portion of the ventricular complex increased, as did the amplitude of the T wave in the chest leads. The stroke volume (exocardiography) increased by 11-13 percent, the minute volume accordingly decreased. Other indicators of central hemodynamics did not undergo substantial changes.



According to subjective indicators, taking ephedrine on a background of antiorthostasis increased the flow of blood to the head, but nevertheless promoted relatively rapid adaptation to antiorthostasis (over the course of 50-70 minutes). In a number of cases, scopolamine improved the ability to withstand antiorthostasis, but in certain subjects it caused a stronger sense of blood flowing to the head and painful sensations in the eyes. During this, the development of dryness in the mucous membrane of the oral cavity, weakness, and a slightly intoxicated feeling should be noted.

Pipolphen under conditions of antiorthostasis increased sleepiness, weakness of the skeletal muscles, and unwillingness to carry out the experimenter's tasks. When the use of ephedrine was combined with pipolphen and scopolamine, these reactions were less marked.

The drugs studied did not cause statistically significant changes in the pulse and arterial pressure. Their values were determined mainly as a result of antiorthostasis. But ephedrine and ephedrine in combination with pipolphen inhibited the development of bradycardia and increased arterial pressure by an average of 10 percent. Ephedrine in combination with scopolamine partially eliminated the pharmacological effects of the latter. It should also be noted that pipolphen, without changing systolic pressure as compared to the background, increased (by 10-18 percent) diastolic pressure and reduced pulse pressure.

The most significant changes in antiorthostasis in the use of preventive medicines for MS were seen in indicators of cerebral circulation. As is clear from Table 1, judging by the rheographic index, the pulse blood saturation of the brain (PBSB) in the control group increased reliably over the course of the first hour of antiorthostasis and decreased somewhat in subsequent periods and in the period of aftereffect. Use of a placebo, judging by the dynamics of the rheographic index, had no significant effect on PBSB as compared to both the background and the data of the control group. Ephedrine practically nullified the effect of antiorthostasis on PBSB over the course of the entire period of observation. The rheographic index during this was lower than the background values and the corresponding indicators of the control during all periods of antiorthostasis. Antihistamine drugs (pipolphen, phencarol), and also scopolamine had practically no effect on the dynamics of PBSB during antiorthostasis.

When the use of ephedrine was combined with pipolphen and scopolamine, a statistically significant reduction of PBSB was observed during the later periods of antiorthostasis (6 hours) and in the period of aftereffect, and also 1 and 3 hours later, respectively.

As is well known, analysis of rheograms makes it possible to determine, along with the rheographic index, the state of tonus of small vessels (arterioles and venules) based on diastolic and diastolic indices, as well as the tonus of the major vessels by the index of elasticity (15).

Table 1--Dynamics of Pulse Blood Saturation of the Brain (Rheographic Index) During Antiorthostasis With the Use of Pharmacological Compounds (M<sub>10</sub>m)

Experimental Conditions	Background	Duration of Antiorthostasis					Aftereffect
		5 min.	15 min.	1 hr.	3 hr.	6 hr.	
Control	1.43±0.13	1.98±0.22*	2.17±0.24*	1.52±0.16	1.32±0.13	1.39±0.10	1.12±0.09
Placebo	1.41±0.08	1.79±0.11*	1.91±0.13*	1.47±0.10	1.36±0.13	1.38±0.16	1.14±0.09*
Ephedrine	1.35±0.10	1.27±0.08	1.33±0.08	1.12±0.09	0.95±0.07*	1.13±0.03*	1.08±0.09
Scopolamine	1.50±0.12	1.89±0.15*	1.81±0.13*	1.37±0.13	1.15±0.05*	1.43±0.14	1.22±0.11
Pipolphen	1.56±0.13	1.86±0.13	1.82±0.17	1.24±0.10*	1.28±0.13	1.54±0.18	1.34±0.18
Phencarol	1.45±0.14	—	—	1.70±0.15	1.19±0.12	1.20±0.13	1.26±0.12
Ephedrine+Scop.	1.33±0.12	—	—	1.12±0.07	1.02±0.10*	1.02±0.07*	1.00±0.07*
Ephedrine+Pipol.	1.52±0.05	—	—	1.29±0.10*	1.37±0.13	1.07±0.13*	2.01±0.17*

Note: Here and in Tables 2-4 the asterisk refers to a statistically reliable difference from the background with  $P < 0.05$

Table 2--Dynamics of the Dicrotic Index in Antiorthostasis With the Use of Pharmacological Agents (M<sub>10</sub>m)

Experimental Conditions	Background	Duration of Antiorthostasis					Aftereffect
		5 min.	15 min.	1 hr.	3 hr.	6 hr.	
Control	59.71±2.45	62.35±3.90	65.86±2.89	64.31±4.33	68.21±4.17	69.32±3.14*	67.51±2.42*
Placebo	58.16±3.52	62.39±2.19	61.44±2.34	63.18±3.82	53.71±2.46	55.79±2.81	52.17±2.54
Ephedrine	59.34±2.15	59.26±3.81	61.83±4.43	57.61±4.07	60.11±6.24	57.61±5.14	59.34±6.81
Scopolamine	57.03±2.77	52.01±4.85	46.08±5.32	33.53±4.26*	46.08±3.31*	54.52±5.05	60.33±3.28
Pipolphen	60.18±2.17	40.14±2.59*	42.78±4.56*	51.51±6.34	54.94±5.14	56.68±5.25	57.59±5.21
Phencarol	58.47±2.19	—	—	56.89±3.14	56.89±3.29	58.47±4.13	67.35±7.38
Ephed. + Scop.	55.30±2.28	—	—	58.17±6.09	39.66±5.73	59.61±5.79	59.94±5.03
Ephed. + Pipol.	58.49±2.50	—	—	58.49±4.32	59.92±5.18	57.02±6.97	62.11±2.71

The dirotic index in the control group (Table 2) during antiorthostasis showed a tendency to increase (by 5-17 percent) over the course of the entire time of the experiment and during the period of aftereffect. Taking the placebo had no substantial effect on the dynamics of this indicator. Of the substances studied, the most significant reduction of the dirotic index over the course of the entire time of antiorthostasis was observed in the case of taking scopolamine and pipolphen. The reduction of the dirotic index caused by these substances during antiorthostasis was almost completely nullified when they were used in combination with ephedrine.

Analysis of the dynamics of the diastolic index (Table 3) during antiorthostasis in the control group in later periods and in the period of aftereffect allows us to speak of increased tonus of the venules and drainage of blood. Scopolamine and pipolphen reduced the diastolic index over the course of the entire time of observation, while ephedrine, in comparison with the background and the control, either had no effect or actually increased it. When the use of ephedrine was combined with pipolphen or scopolamine, judging by the diastolic index, the tonus of venules and drainage of blood approached practically to the values of the control and slightly exceeded the background data. Thus, ephedrine completely stopped the reduction in the diastolic index during antiorthostasis caused by scopolamine and pipolphen.

As for the index of elasticity (Table 4), in the control group during the early periods (5 minutes) after an individual went into the antiorthostatic position, it increased, with subsequent normalization. Ephedrine and scopolamine had no substantial effect on the index of elasticity in the early periods of antiorthostasis and increased it over a more prolonged time (3-6 hours). When the use of ephedrine was combined with pipolphen or scopolamine the index of elasticity was reduced.

The data presented allow us to conclude that in modeling EPAW using 6-hour periods of antiorthostasis significant changes occur in cerebral blood circulation, especially in the early periods (over the course of the first hour). Preventive medicines for MS in separate and combined use exert a significant influence on the hemodynamics of the brain. The results obtained coincide with the data of a number of authors (9, 10) on the effect of pharmacological substances on blood circulation in the brain, indicating that in principle it is possible to correct it pharmacologically under conditions of functional changes.

Earlier we showed (4) that during antiorthostasis the concentration of catecholamines in human blood increases. Preventive medicines for MS did not prevent an increased reaction of the sympathetic-adrenal system during antiorthostasis, but the level of catecholamines was substantially lower than in control experiments. The greatest effectiveness in this was observed for pipolphen and pipolphen with ephedrin. With this combination the concentration of noradrenaline in the blood was practically no different from the background values over the course of the entire time of antiorthostasis. Analogous results were obtained in studying the concentration of serotonin in the blood during antiorthostasis. However, the concentration of histamine and its predecessor, histidine, in this did not change. Therefore, it is logical

Table 3--Dynamics of the Diastolic Index During Antiorthostasis With the Use of Pharmacological Substances (Mmm)

Experimental Conditions	Background	Duration of Antiorthostasis				Aftereffect
		5 min.	15 min.	1 hr.	3 hrs.	6 hrs.
Control	63.71±3.26	68.74±3.11	61.24±3.41	71.12±4.14	67.05±4.27	69.41±5.39
Placebo	64.29±3.11	70.33±2.46	61.33±3.28	73.35±4.26*	70.26±2.35	66.78±3.52
Ephedrine	63.50±4.05	71.62±4.26	67.56±5.43	60.45±5.34	68.00±6.09	67.11±6.41
Scopolamine	71.09±6.44	57.04±5.22	56.67±5.48	45.56±6.11*	57.70±4.16	65.47±4.35
Pipolphen	70.27±5.36	45.74±4.22*	49.18±5.06	57.97±6.43	59.72±5.68	60.22±6.04
Phencarol	66.29±6.01	—	—	66.85±5.43	62.87±2.51	65.29±4.32
Ephedrine+Scop.	63.98±5.30	—	—	66.52±3.09	70.05±4.08	69.61±4.37
Ephed. + Pipol.	70.18±5.94	—	—	74.53±4.48	80.70±4.26	77.19±4.43
						67.37±4.25 68.58±4.27 73.43±4.49 63.31±3.34 71.05±5.04 68.52±4.34 76.84±4.67

Table 4--Change in Tonus of Major Blood Vessels (Index of Elasticity) During Antiorthostasis With the Use of Pharmacological Substances (Mmm)

Experimental Conditions	Background	Duration of Antiorthostasis					Aftereffect
		5 min.	15 min.	1 hr.	3 hrs.	6 hrs.	
Control	19.21±1.33	25.62±1.42	26.11±1.29	19.40±1.69	17.86±1.26	19.51±1.26	19.42±1.18
Placebo	19.10±1.35	24.37±1.48	24.08±1.64	20.52±1.42	18.39±1.61	21.16±1.29	19.32±1.12
Ephedrine	20.72±2.00	23.93±1.54	30.69±1.72	22.56±1.49	25.25±1.66	25.25±1.37	23.93±1.25
Scopolamine	17.80±1.45	21.53±1.78	24.03±1.67	23.31±1.57	21.53±1.54	22.76±1.23	17.80±1.14
Pipolphen	21.04±1.98	21.84±1.63	21.04±1.32	19.95±1.71	18.80±1.46	20.37±1.27	18.06±1.33
Phencarol	19.42±1.44	—	—	26.70±2.15	17.46±2.23	21.53±2.16	19.45±1.37
Ephed. + Scop.	19.35±1.72	—	—	21.10±1.17	14.47±1.22	15.58±2.52	15.59±2.41
Ephed. + Pipol.	19.72±1.68	—	—	19.58±1.35	15.54±2.18	15.59±1.66	21.82±1.29



to assume that in the mechanism of the normalizing effect of preventive medicines for MS on the cardiovascular system during antiorthostasis an important place belongs to their regulating effect on the functional state of the sympathetic-adrenal system. This is even more probable when we consider that in the pathogenesis of MS a quite significant feature is the complex of shifts in the mediator links of regulating the involuntary functions (7). Here attention should be focused on the fact that although the effectiveness of preventive medicines for MS under the conditions of earth is a scientifically substantiated fact, there is still a certain opinion, without adequate grounds, that their effectiveness is reduced under conditions of weightlessness. Taking into account the fact that the central mechanisms of developing MS involve cholinergic receptors and histamineH-1 receptors, we consider it clear that the effectiveness of cholinolytics during MS and certain cardiovascular effects are caused by their being blocked by drugs of these groups (16, 17). Apart from this, there is direct evidence that the vestibular apparatus plays a crucial role in regulating tonus of the vessels in the brain (8-10), and sympathomimetics (13) and antihistamine drugs (14) increase the blood flow in the brain.

Thus, we may assume that the data obtained prove that in principle it is possible to correct functional changes of hemodynamics in modeling EPAW with the use of preventive drugs for MS. These changes may play a crucial role in the mechanisms by which MS develops and in the prophylactic effect of preventive medicines for MS.

#### Conclusions

1. Under conditions of an antiorthostatic position, with the angle of inclination of the cranial part of the human body at  $-15^{\circ}$ , subjective and objective indicators were used to develop the complex of symptoms characteristic for the early period of adaptation to weightlessness.
2. Pharmacological agents for preventing motion sickness (scopolamine, pipolphen, ephedrine) in separate and combined use improve the rheographic indicators of blood circulation in the brain in modeling the early period of adaptation using exposure to antiorthostasis.
3. The drugs do not cause reliable changes in the frequency of cardiac contractions, arterial pressure, or electro- and exocardiographic indicators during a 6-hour period of antiorthostasis.

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DURATION OF NARCOTIC EFFECT OF NEMBUTAL IN HYPERBARIA

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian Vol 49, No 3, May-Jun 86  
(manuscript received 25 Dec 84) pp 32-35

[Article by A. Yu. Sledkov and G. V. Troshikhin, Hyperbaric Physiology Group  
(led by G. V. Troshikhin) of the USSR Academy of Sciences Institute of  
Physiology imeni I. P. Pavlov, Leningrad: "Duration of Narcotic Action of  
Nembutal Under Conditions of Hyperbaria"]

[Text] In current diving practice the most promising method is acknowledged to be saturated submersions, during which the aquanauts spend a prolonged time in special barocomplexes filled with an artificial gas environment under high pressure, and periodically come out onto land to carry out jobs. It is completely acceptable that, as a result of sleep disruption under the conditions of hyperbaria, the aquanauts are forced to resort to the aid of drugs. Despite the fact that a number of works examine the effect of narcotic substances under hyperbaria (4-6), this question is still far from settled.

The task of this study was to determine the duration of the narcotic effect of nembutal on animals in various gas mixtures under increased pressure.

Methods of the Study

The experiments were carried out on male Wistar rats with a mass of 200-250 grams; the animals were parenterally given a 1 percent solution of nembutal (sodium pentobarbital) in a dose of 40 mg per 1 kg of body mass, then they were placed in a pressure chamber (six to eight animals at a time) with a closed system of regenerating gas mixture. As the animals lay on their sides, they were subjected to compression up to 6, 10, 20, and 40 kilogauss/cm<sup>2</sup>. The speed of compression was equal to 0.15, 0.25, 0.5, and 1.0 kilogauss/cm<sup>2</sup> per minute, respectively, so the duration of compression in each individual experiment was always identical (40 minutes). Under conditions of hyperbaria, the lengths of time after which the animals stood up on their paws and took a normal position were recorded.

Three series of experiments were done, in which the rats were exposed to normoxic helium-, nitrogen-, and helium-nitrogen-oxygen mixtures at the pressures specified above. In the last series of experiments, the partial pressure of nitrogen in the mixture, regardless of the total pressure, was identical and equaled  $0.6 \text{ microgram/cm}^2$ . In the control experiment, air was blown through the chamber over the course of 40 minutes, after which it was covered and the rats left in the air environment at atmospheric pressure until the effects of the nembutal wore off. One group of animals was exposed to a nitrogen-oxygen mixture at a pressure of  $40 \text{ kilogauss/cm}^2$  without being drugged. The temperature of the environment was maintained within the limits of the comfort zone for rats:  $31^\circ\text{C}$  in the helium and  $28^\circ\text{C}$  in the nitrogen-oxygen environment (3). The carbon dioxide exhaled by the animals was completely absorbed by soda lime, and the relative moisture of the environment was 80-85 percent. Statistical processing of the data obtained was done by the Student-Fisher method. A total of 370 rats were used in the experiments.

### Results

In the helium-oxygen mixtures under pressure, the narcotic effect of the nembutal was of markedly shorter duration than in the control experiment. But as the pressure of the helium-oxygen medium was increased, the duration of narcotic effects in the rats increased somewhat, but even under maximum pressure the animals remained in a lateral position an average of 26 minutes less ( $P < 0.005$ ) than those in air at atmospheric pressure.

In the nitrogen-oxygen mixtures under pressure, conversely, a longer duration of the nembutal's narcotic effect was observed. Thus, in this environment, under a pressure of  $6 \text{ kilogauss/cm}^2$ , the duration of narcotic effect increased by an average of 18 minutes compared to the control experiment, and by 33 minutes compared to the control under a pressure of  $20 \text{ kilogauss/cm}^2$  ( $P < 0.005$  in both cases). In the experiment where the pressure of the nitrogen-oxygen mixture was raised to  $40 \text{ kilogauss/cm}^2$ , the rats did not take a natural position at all; they had periodic convulsions and finally died. Of the 18 rats in this experiment, one-third died after 3 hours and the rest after 12-20 hours. In the nitrogen-oxygen environment under a pressure of  $40 \text{ kilogauss/cm}^2$  without nembutal dosing, out of six rats one died after 12.5 hours, and the remaining after an average of 35 hours. Under these conditions the rats did not assume the lateral position characteristic of narcosis, but after approximately 10 hours they spread themselves out on the floor of the pressure chamber and had periodic convulsions.

A different picture emerged under pressure in the helium-oxygen environment with the addition of nitrogen. In this series of experiments the duration of nembutal narcosis was shorter than in air at atmospheric pressure, but it decreased with an increase in the total pressure. For example, at a pressure of  $6 \text{ kilogauss/cm}^2$ , the duration of narcosis in the rats was an average of 78 minutes, while at a pressure of  $40 \text{ kilogauss/cm}^2$  it was 19 minutes shorter ( $P < 0.005$ ).

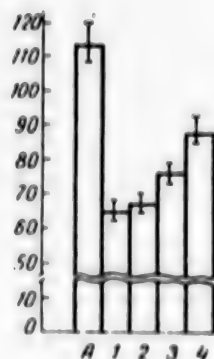


Fig. 1

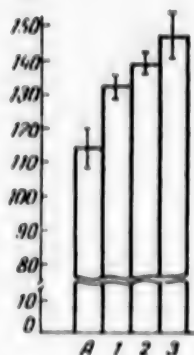


Fig. 2

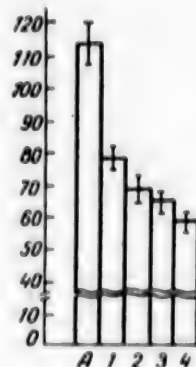


Fig. 3

Fig. 1. Duration of narcotic effect of nembutal in helium-oxygen mixtures at various pressures.

Along the y-axis--duration of narcotic effect (in minutes); along the x-axis: A--in air at atmospheric pressure (control), 1--a pressure of 6 kilogauss/cm<sup>2</sup>, 2--pressure of 10 kilogauss/cm<sup>2</sup>, 3--pressure of 20 kilogauss/cm<sup>2</sup>, 4--pressure of 40 kilogauss/cm<sup>2</sup>.

Fig. 2. Duration of narcotic effect of nembutal in nitrogen-oxygen mixtures at various pressures.

Notation is the same as in Fig. 1.

Fig. 3. Duration of narcotic effect of nembutal in helium-nitrogen-oxygen mixtures at various pressures.

Notation is the same as in Figs. 1 and 2.

#### Discussion of Results

Thus, nitrogen and helium under increased pressure have different effects on the duration of nembutal narcosis: the first raises it to a higher power, while the second has an antagonistic effect, which should be taken into account in using this drug under conditions of hyperbaria.

The general opinion is that hyperbaria as such weakens the effect of anesthetics, since increased pressure reduces the volume of the lipid part of cellular membranes in which a narcotic substance is dissolved (6). But, as our study showed, the basic role in this process is played not so much by pressure as by the inert gas used in the gas mixture, the diluter of oxygen. A certain significance in increasing the narcotic effect of nembutal, probably, pertains to the density of the gas inhaled. Thus, for example, in a helium-oxygen environment under a pressure of 40 kilogauss/cm<sup>2</sup> (density of 7.64 g/l), the duration of narcosis in the rats was an average of 88 minutes, while under a pressure of 6 kilogauss/cm<sup>2</sup> (density of 1.52 g/l) it was only 65 minutes ( $P < 0.005$ ). At the same time, in a nitrogen-oxygen mixture under a pressure of 6 kilogauss/cm<sup>2</sup>, which is comparable in density to helium-oxygen under a pressure of 40 kilogauss/cm<sup>2</sup>, the duration of narcosis in the rats was



statistically significantly greater (132 minutes)--that is, these gases under pressure have a different effect on the central nervous system. The high density of the environment promotes retention of carbon dioxide in the body, and excess carbon dioxide can enhance the narcotic effect of nembutal.

Particular interest is presented by comparison of the duration of narcosis in animals in a helium-nitrogen-oxygen mixture at various pressures, since it is this mixture which is most frequently used in diving practice. Furthermore, it is well known that oxygen and helium narcoses are not summed together (1). In this series of experiments the most prolonged narcosis (78 minutes) was in the experiment in which the total pressure was six kilogauss/cm<sup>2</sup>, of which 0.6 kilogauss/cm<sup>2</sup> was due to nitrogen. The briefest narcosis (59 minutes) was in the experiment with a total pressure of 40 kilogauss/cm<sup>2</sup> (with the same partial pressure of nitrogen). The duration of narcosis here turned out to be statistically significantly less than in the helium-oxygen mixture at analogous pressures with an admixture of nitrogen (88 minutes). This difference, clearly, testifies to the antagonism of nitrogen and helium in their effects on the central nervous system at increased pressures. According to some data, nitrogen and helium under pressure affect different structures of the central nervous system (2, 5). Ratios of the partial pressures of nitrogen and helium can probably be found at which the duration of nembutal narcosis is at a minimum or, conversely, a maximum.

Thus, the research carried out testifies that under conditions of hyperbaria the narcotic effect of nembutal is weakened in a helium-oxygen environment, and increased in a nitrogen-oxygen one, which is the result of the antagonistic nature of the influences of nitrogen and helium under increased pressure on the central nervous systems of animals.

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# INHIBITION OF SINDBIS VIRUS INFECTION IN MICE BY NORAKIN (TRIPERIDEN)

Bratislava ACTA VIROLOGICA in Russian Vol. 29, No 3, May 85  
(manuscript received 15 Aug 84) pp 209-215

[Article by A. Veckenstedt, J. Guttner and C. Schroeder\*, Central Institute of Microbiology and Experimental Therapy, Academy of Sciences of the GDR, Jena; \*Institute of Virology, Humboldt University, Berlin, GDR]

[Abstract] Therapeutic trials were conducted with Norakin<sup>R</sup> (triperiden HCl) on 4-6 week old male (AB/Jena x DBA/2 Jena) F<sub>1</sub> hybrid (ABD2F<sub>1</sub>) mice infected intranasally with Sindbis virus. Infection with a 10 LD<sub>50</sub> dose of the virus resulted in death within 3-7 days with extensive systemic histopathology. Death usually followed by 24 h the onset of neurological complications. Evaluation of various therapeutic schedules demonstrated that Norakin imparted maximum protectiveness when used per os in doses of 2.5 or 5 mg/kg b.i.d. for at least 56 h, treatment commencing 1 or 12 h before infection. The survival rates with these doses were 20 and 50%, respectively. The survival rates were also improved with daily doses of 10 mg/kg, but higher doses ( $\geq$  25 mg/kg) were either less effective or ineffective. In addition, toxicity tests demonstrated that the ABD2F<sub>1</sub> mice tolerated Norakin in a dose of 300 mg/kg for 104 h well, without any clinical or histological evidence of adverse effects. Norakin did not inhibit reproduction of the Sindbis virus in BHK 21/C13 cells in concentrations up to 10  $\mu$ g/ml, and was ineffective in protecting mice from Mengo virus in doses up to 50 mg/kg. These observations indicate that Norakin will not be useful in managing togavirus infections. Figures 1; references 11: 3 Russian, 8 Western.

12172/9835  
CSO: 1840/184

PHYSIOLOGY

UDC 612.273.2.024+615.384+547.221

CHANGE IN MASS TRANSFER OF BLOOD GASES IN HYPOXIA AFTER PERFLUOROCARBON EMULSION INFUSION

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I.M. SECHENOVA in Russian  
Vol 72, No 2, Feb 86 (manuscript received 25 Jan 85) pp 231-238

[Article by I.N. Kuznetsova, K.A. Gerbut and L.V. Lyagushkina, Laboratories of Blood Substitutes (headed by L.A. Sedova), and Experimental Pathology (headed by N.I. Kochetygov), Scientific Research Institute of Hematology and Blood Transfusion, Leningrad]

[Abstract] An attempt was made to estimate the change in mass transfer of blood gases upon circulation of relatively small volumes of a perfluorocarbon emulsion phase in the vascular bed. The parameters of systemic hemodynamics, physical-chemical homeostasis and rheological properties of the blood were determined following blood loss, replacement of lost blood with an excess volume of saline solution, and infusion of a small volume of perfluorocarbon emulsion. The physiological reactions of compensation for the oxygen shortage in anemic hypoxia were significantly improved by the presence of the relatively small volume of perfluorocarbon emulsion in the blood. The main reason for the improvement was an increase in the intensity of blood gas mass transfer processes. Figures 4; references 20: 10 Russian, 10 Western.

6508/9835

CSO: 1840/231

## INFLUENCE OF NORADRENALINE ON OXYDATIVE METABOLISM IN COLD-ADAPTED GOLDEN HAMSTERS

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I.M. SECHENOVA in Russian  
Vol 72, No 2, Feb 86 (manuscript received 23 May 85) pp 246-252

[Article by L.S. Maslennikova, Laboratory of Blood Transport Function  
(headed by Yu.Ya. Kislyakov), Institute of Physiology, imeni I.P. Pavlov,  
USSR Academy of Sciences, Leningrad]

[Abstract] The purpose of this work was to study the specifics of oxidative metabolism under the influence of noradrenaline in chronic experiments on animals after exposure to cold for short and long periods of time. The studies were performed on 200 golden hamsters. One group of animals was exposed to a temperature of plus 4°C, 5 hours per day, for 7 and 40 days, while the other group was maintained at 22°C. Administration of noradrenaline 0.2 mg/kg i/m was found to cause characteristic changes in noncold adapted hamsters only in the zone of thermal neutrality at 26°C. Upon cooling to 10°C the reaction was absent. Administration of noradrenaline increased skin temperature in all groups of animals only in the thermally neutral zone. In the cold adapted animals, the hormone influenced temperature regulation under cold conditions as well. The experiments indicate that noradrenaline increases oxidative metabolism both at the level of the whole organism and at the level of individual tissues. The influence of noradrenaline is particularly strong in the cold-adapted hamsters, indicating the greater energy capacity of the skeletal muscles and mobilization of noncontractile heat formation in the cold adapted animals. One probable biochemical mechanism of this action is switching of respiration to a metabolic path related to separation of respiration from phosphorylation. Figures 3; references 15: 11 Russian, 4 Western.

6508/9835

CSO: 1840/231

## INFLUENCE OF OXYGEN INSUFFICIENCY ON BRAIN CELLS IN CULTIVATION AND SURVIVING SECTIONS

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I.M. SECHENOVA in Russian  
Vol 72, No 3, Mar 86 (manuscript received 8 Aug 84) pp 330-336

[Article by I.G. Vlasova, L.D. Lukyanova and N.A. Agazhanyan, Department of Normal Physiology (headed by N.A. Agazhanyan), University of Friendship of the Peoples imeni P. Lumumba, Moscow; Department of Functional Bioenergetics (headed by L.D. Lukyanova), Scientific Research Institute for Biological Testing of Chemical Compounds, Kupavna, Moscow Oblast]

[Abstract] A study is reported of the reactions of cells--from various segments of the central nervous system of mammals in tissue culture and surviving sections--to changes in partial pressure of oxygen. Explanates of the visual cortex of the brain and the cerebellum of one-to-two-day-old mice were studied on days 19 through 25 of cultivation, as well as freshly isolated sections of the hippocampus and cerebellum, 300-400  $\mu$ m thick, obtained from 18-to-30-day-old mice. Decreasing the partial pressure of oxygen was found to cause phased changes in pulse activity reflecting the status of the respiratory chain. Different cell types were found to have differing sensitivity to oxygen deficiency. Purkinje cells were quite resistant to oxygen deficiency, cells of the visual cortex retaining high level of functional activity with  $pO_2$  reduced to 50% of the initial level. Cell mechanisms responsible for maintaining neuron functioning in oxygen deficiency were found to be energy dependent. Brain cells in vitro react sharply to changes in oxygen pressure and can be used as a model system for the study of the mechanism of the process and in the search for antihypoxants. Figures 5; references 17: 10 Russian, 7 Western.

6508/9835

CSO: 1840/332

## BLOOD CIRCULATION AND OXYGEN PRESSURE IN BRAIN OF ALERT RABBITS SUBJECTED TO ROCKING

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I.M. SECHENOVA in Russian  
Vol 72, No 3, Mar 86 (manuscript received 4 Apr 85) pp 352-356

[Article by N.A. Skoromny, I.T. Demchenko, A.I. Bekemov and Yu.Ye. Moskalenko, Department of Pharmacology, Pediatric Faculty With Course of Clinical Pharmacology (headed by A.I. Beketov) Crimean Medical Institute, Simferopol; Laboratory of Comparative Physiology of Blood Circulation (headed by Yu.Ye. Moskalenko), Institute of Evolutionary Physiology and Biochemistry imeni I.M. Sechenov, USSR Academy of Sciences, Leningrad]

[Abstract] Quantitative methods were used to analyze the status of the general and local blood circulation in the brain, considering the dynamics

of changes in oxygen partial pressure at the sites of measurement of local blood flow in rabbits exposed to rocking. Studies were performed on 17 rabbits. There were two series of experiments, the first studying the dynamics of changes in blood flow and  $pO_2$  in the brain tissue during rocking, while in the second the influence of rocking was studied on the systemic arterial pressure of the same animals. Measurements were taken before the vestibular stimulus was begun, each 5 to 10 minutes during rocking, which lasted 60 minutes, and over 1 to 2 hours after rocking at 30-34 cycles per minute. Rocking was found to cause an increase in local blood flow in the frontal, occipital and temporal areas of the cortex and an increase in total blood flow, developing against a background of unchanged  $pO_2$  level in the cerebral cortex and hypotension. The increase in blood flow is considered to be a reflex dilation of the cerebral vessels from the vestibular analyzer and an intensification of metabolism to generalized activation of cortical structures. Figures 2; references 15: 11 Russian, 4 Western.

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CSO: 1840/232

UDC 612.592+612.51

DEVELOPMENT OF CERTAIN REACTIONS TO INJECTION OF NORADRELANINE IN CONTROL AND COLD-ADAPTED RATS

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I.M. SECHENOVA in Russian  
Vol 72, No 3, Mar 86 (manuscript received 31 Oct 83) pp 377-381

[Article by T.V. Kozyureva, I.N. Sindarovskaya and P.V. Lazarenko, Laboratory of Temperature Regulation (headed by M.A. Yakimenko), Institute of Clinical and Experimental Medicine, Siberian Department, USSR Academy of Medical Sciences, Novosibirsk]

[Abstract] An attempt was made to estimate the time parameters and sequence of development of various reactions in control and cold-adapted rats upon administration of exogenous noradrelanine. Experiments were performed on male white rats under narcosis. Control animals were maintained at 20-22°C, adaptation to control was performed in a chamber at 3-4°C, six weeks. Noradrelanine was administered intraabdominally in saline solution. Experiments were performed in June. Adaptation of the organism to cold was found not only to increase the rate of development of effector reactions, but also to decrease the latent periods and threshold of inclusion of the reaction of increased oxygen consumption and heat liberation as the noradrelanine concentration increased in the blood. Figures 2; references 15: 10 Russian, 5 Western.

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## GALVANIC SKIN RESPONSE IN ESTIMATION OF ONE MINUTE TIME INTERVALS

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 30 Jul 84) pp 744-749

[Article by O.S. Rayevskaya, T.D. Dzhebrailova and S.A. Kuznetsov,  
Scientific Research Institute of Normal Physiology imeni P.K. Anokhin,  
USSR Academy of Medical Sciences, Moscow]

[Abstract] An analysis was conducted on the relationship between the galvanic skin response (GSR) and EKG and EEG in 7 young adults (18-20 years) required to perform a mental task and subjected to a physical stimulus thereafter. The test conditions required estimation of a one minute interval, an impartial verbal evaluation of the estimate ("good" or "poor"), followed in 2-3 min by photostimulation (5 Hz, 10 sec) in the darkened room. In the count-off process the GSR showed considerable individual variation in the form of multiphasic patterns, attaining in some cases 200-250  $\mu\text{V}\cdot\text{sec}$ . Photostimulation resulted in attenuation of the GSR on both hands and the onset of a biphasic pattern in each of the subjects. In the 20-sec period following the time count-off, most subjects showed considerable GSR asymmetry between the right and left hands, which at rest and during photostimulation was more pronounced on the left hand. During actual time estimation the GSR was more pronounced on the right hand, with no apparent correlation between GSR asymmetry and the EEG recordings. However, during the anticipatory phase of decision making and in correct decisions, definite correlations were established between the GSR, the R-R interval, and the EEG. During photostimulation there were no such correlations between the GSR and the EKG (EEG was not studied). These observations point to the usefulness in using GSR in assessing orienting and emotional reactions as an expression of CNS activity. Figures 3; references 21: 14 Russian, 7 Western.

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UDC 612:133+616:092

## BIOPHYSICAL BASIS FOR TWO-COMPONENT ANALYSIS OF PULSE BIOSIGNALS

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 5 Feb 85) pp 783-787

[Article by I.Ye. Sokolova, Moscow]

[Abstract] A method has been devised to assess the cardiovascular system in terms of superimposition of arterial and venous pulse waves to derive a differential rheogram. Such a system should lend itself to computer-based

automatic analysis and provide yet another noninvasive diagnostic tool. This approach delineates arterial and venous pulsations in relation to systolic output and diastolic inflow, providing thereby information on vascular tone of the arteries, veins, and capillaries, as well as on the adequacy of systolic and diastolic cardiac functions. Figures 5; references 5 (Russian).

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#### NEUROCHEMICAL FOUNDATIONS FOR CHEMICAL THERMOREGULATION AND ARTIFICIAL HYPOBIOSIS

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 29 Apr 85) pp 839-851

[Article by N.N. Timofeyev, Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow]

[Abstract] Experimental data and theoretical assumptions are combined to provide an explanation for chemically-mediated body temperature regulation and induction of artificial hypobiotic states. It is now generally accepted that the CNS centers that are responsible for chemical temperature regulation elicit a systemic activation of adrenergic neurons leading to shivering thermogenesis. The intensity and force of shivering thermogenesis are directly related to the release of extraneural catecholamines, particularly the secretion of epinephrine by the adrenal glands. The first component of this system is felt to be highly specialized, while the second—release of extraneural epinephrine—may arise in other stress situations in addition to cold exposure. Elimination of the shivering component requires interference with the action of the adrenergic factors on the presynaptic membrane of the myoneural junction. The latter may be attained either by exhaustion of the adrenergic depot, blockage of catecholamine release from adrenergic neurons, interference with catecholamine synthesis, or the introduction of inactive catecholamine analogs. The net effect is to prevent release of acetylcholine from the presynaptic membrane and, thence, muscle contraction. Such methods may be useful in inducing artificial hypobiosis simulating hibernation. Figures 7; references 24: 21 Russian, 3 Western.

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## PREDICTION OF PHYSICAL WORK FITNESS IN HOT ENVIRONMENT

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 2 Jan 84) pp 852-855

[Article by O.S. Goretskiy, V.A. Maksimovich, L.S. Shevchenko and D.Ya. Mironyuk, Scientific Research Institute of Labor Hygiene and Occupational Diseases, Donetsk]

[Abstract] Ergometric studies were conducted on a group of 200 men, 20-30 years of age, to define parameters useful in determining physical job fitness (ergothermal tolerance) in hot environments. The subjects, including 100 adapted to high-temperature work in mine rescue operations, were subjected to a physical workload of 61 W in a room with 147 kJ/kg heat capacity. Evaluation of pulmonary and cardiovascular function parameters led to construction of regression models capable of providing fitness reports accurate in 70-75% of the cases. In addition, determinations of the susceptibility of erythrocytes to hemolysis at 58.4-58.6°C showed an agreement with the former method of determination in 80% of the cases. Combination of the ergometric assessment with the erythrocyte study raised the probability of an accurate assessment to 80-91%. These observations indicate that such methods may be employed in evaluating job fitness for high-temperature occupations, and in rehabilitation medicine. Tables 1; references 19 (Russian).

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## VISUAL FIGURE PERCEPTION WITH SIMILAR-FIGURE MASKING

Moscow FIZIOLOGIYA CHELOVEKA in Russian Vol 11, No 5, Sep-Oct 85  
(manuscript received 2 Nov 83) pp 859-861

[Article by V.M. Krol and V.D. Sosina, Institute of Control Problems (Automation and Telemechanics), Moscow]

[Abstract] A quantitative investigation was undertaken to define the relationship between figure recognition and the degree of similarity between the test and masking image in terms of perception threshold time. The three-channel tachiscopic study involved geometric figures represented by cubes, squares and triangles. The data clearly demonstrated that variations in the threshold recognition times may be used to assess the degree of similarity. Furthermore, the increase in the threshold values may be used to rank figures on the basis of similarity to a selected

central pattern on the basis of component structures and fragments.  
Figures 1; references 10: 2 Russian, 8 Western.

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NADH-VANADATE-OXIDOREDUCTASE DURING EMOTIONAL-PAIN STRESS AND ITS  
IMPLICATION IN REGULATION OF  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase ACTIVITY

Kiev UKRAINSKIY BIOKHMICHESKIY ZHURNAL in Russian Vol 57, No 6, Nov-Dec 85  
(manuscript received 24 Jan 85) pp 34-38

[Article by V.S. Yakushev, O.B. Makoyed, V.I. Davydov and Ye.A. Shkopinskiy,  
Zaporozhe Medical Institute]

[Abstract] Most of human and animal organs have NADH-vanadate-oxidoreductase (I) which catalyzes conversion of  $\text{VO}_3^-$  to  $\text{VO}^{2+}$ . Activity of I in the heart and brain was studied in rats during emotional-pain stress (EPS) along with the dynamics of  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase and  $\text{pO}_2$  in blood. It was shown that during early (48 hrs) acute EPS period, I was activated in brain and decreased in heart. At later periods, I was stimulated in both organs. This causes different accumulation of  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase inhibitors such as  $\text{VO}_3^-$  in the heart and brain. Increase in blood  $\text{pO}_2$  enhances the concentration of  $\text{VO}_3^-$  in the organs studied during EPS. Figure 1; references 9: 3 Russian, 6 Western.

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NEURONAL ORGANIZATION OF INHIBITORY PROCESSES IN RAT SOMATOSENSORY CORTEX  
COLUMNS

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 31, No 5, Sep-Oct 85  
(manuscript received 1 Apr 85) pp 584-589

[Article by A.G. Sukhov and T.K. Lapenko, Institute of Neurocybernetics,  
Rostov-on-Don University]

[Abstract] A combination of electrophysiological and histochemical techniques were employed in a study on the neuronal basis of inhibitory processes in somatosensory cortical columns of the albino rat. The functional columns are apparent both electrophysiologically and from retrograde axonal transport of exogenous horseradish peroxidase at the protection zone of the vibrissae,

demonstrating common innervation from a single vibrissa at level IV. Analysis of the oscillographic recordings resulting from the stimulation of a single vibrissa revealed at least two mechanisms of intracortical inhibition. One mechanism involves afferent and recurrent impulsion and provides for inhibitory interactions among the functional columns. The second mechanism identified consisted of intrapolar inhibition leading to post-excitatory and direction-sensitive (intermodal) inhibition of neurons within a column. The latter mechanism creates functional neuronal assemblies which correspond to the parameters of the initiating stimulus. Figures 4; references 10: 9 Russian, 1 Western.

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#### LEUKOCYTIC ACID PHOSPHATASE ACTIVITY IN EXPERIMENTAL WOUND HEALING

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 31, No 5, Sep-Oct 85  
(manuscript received 25 Jan 84) pp 632-634

[Article by R.U. Lipshits and T.V. Zvyagintseva, Kharkov Medical Institute]

[Abstract] In order to better define the role of lysosomal enzymes in wound repair, measurements were conducted on serum levels and leukocytic acid phosphatase in albino rats with a 400 mm<sup>2</sup> full-thickness skin wound. Over a 20 day period, serum levels of acid phosphatase showed a statistically significant increase--almost two-fold--on day 3. However, studies on spontaneous exocytosis of the lysosomal marker by the peripheral blood leukocytes showed a 3.5-fold increase in activity on day 1 and a 4.5-fold increase on day 3. By day 5, the level of activity returned to baseline values. The enhancement of spontaneous exocytosis of leukocytic lysosomal enzymes points to activation of leukocytes and their involvement in wound repair. Figures 2; references 14: 4 Russian, 10 Western.

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## BLOCKING Ca-DEPENDENT K-CONDUCTIVITY-POSSIBLE GENERAL LINK IN MECHANISM OF ACTION OF ANTIMALARIAL PREPARATIONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 1, Nov 86  
(manuscript received 8 May 86) pp 246-249

[Article by D.A. Sakharov and T.L. Dyakonova, Institute of Developmental Biology imeni N.K. Koltzov, USSR Academy of Sciences, Moscow]

[Abstract] A study of the capacity of other antimalarial and, especially, anti-protozoal drugs to block Ca-dependent K-conductivity (as quinine does) in nerve and muscle cells and erythrocytes is described and discussed. Antimalarial drugs delagil (synonyms: quingamin, chloroquin, resorcin) and acryquine and the anti-protozoal drug aminoquinol were tested on grape snail neurons to determine their Ca-dependent K-conducting blocking capacity. All drugs tested responded in a phenomenologically similar manner to electrophysiological tests and blocked the Ca-dependent K-conductivity during electrical stimulation of the snail cell. In addition to habituation blocking, changes of other nerve cell parameters under the effect of these drugs, including depolarization, increase of  $R_{in}$  and increase of the amplitude and duration of the action potential confirmed the Ca-dependent K-conductivity capacity of these drugs. This capacity may be the source of therapeutic action of these drugs. The fact that practically all antimalarial drugs have a bitter taste was emphasized. Such concoctions are used widely in folk medicine and there is evidence that they might suppress some unidentified component of K conductivity. It was surmised that these bitter substances ensure the same cytophysiological mechanisms which provide the anti-protozoal action of drugs. Figures 2; references 12: 4 Russian, 8 Western.

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## PUBLIC HEALTH

### MEASURES TO IMPROVE MOBILE MEDICAL EQUIPMENT

Moscow MEDITSINSKAYA GAZETA in Russian 9 Jan 87 p 2

[Article by L. Novikov, correspondent]

[Abstract] This lengthy article assesses the quality of mobile medical equipment that is being used in rural areas, including ambulance vehicles, aircraft, and equipment specially designed for them. L.M. Goldenshteyn, deputy chief designer of the RAP motor bus experimental plant, and L.N. Babak, chief physician of the republic air medical-service station of the RSFSR Ministry of Health (Minzdrav), are quoted in regard to the types of mobile equipment which rural medical services now need.

It is recalled that a list of recommended items of mobile equipment for the medical-services system was prepared in 1980. Only 26 of the 90 items on this list are currently in series production. Equipment specially designed for service in extreme climatic conditions is not being produced at all. Goldenshteyn complained that ambulances have been designed on the basis of mass-produced vehicles whose off-road capability and power are inadequate. The resuscitation vehicles "TAMRO-RAP" and "TAMRO-UAZ" were cited as examples. Babak pointed out that the medical service has no airplanes of its own and is dependent upon other agencies for them.

Mention is made in conclusion of a recent all-Union conference on mobile medical equipment, at which ways of improving the organization of R&D in this field were discussed. The USSR Ministry of Instrument Building, Means of Automation and Control Systems, which is one of the producers of such equipment, sponsored this conference. Participants stressed the need for a unified technical policy for the development and use of mobile equipment. They suggested that an organization be created in USSR Minzdrav to draft such a policy, and that the ministry's All-Union Scientific Research and Testing Institute of Medical Equipment oversee its implementation.

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## EXPANDING COMPUTER TRAINING AT MEDICAL COLLEGES

Moscow MEDITSINSKAYA GAZETA in Russian 19 Dec 86 p 3

[Article by A. Krasnov, corresponding member of the USSR Academy of Medical Sciences, president of the Kuybyshev Medical Institute; I. Korolyuk, professor, head of the institute's Chair of Roentgenology and Radiology]

[Abstract] On the basis of experience of the Kuybyshev Medical Institute, the authors discuss problems and ways of improving computer training at medical higher schools.

For modern computer technology to be employed effectively in training courses and clinical practice, future physicians must know how to interact with computers and be familiar with the principles and main types of information and computer technology used in medicine, according to the authors. However, computer-literacy programs at medical higher schools are currently handicapped by inadequate resources. There is a shortage of instructors with suitable qualifications, particularly in the field of computerized information processing, and modern training equipment is costly, the authors explain. They estimate the cost of equipping a single video-terminal class at the Kuybyshev institute to be about 100,000 rubles, an amount which exceeds the institute's entire annual budget for acquiring equipment. They say that medical institutes particularly need DVK-2M computer complexes for video-terminal classes, as well as versatile microcomputers such as the "Elektronika DZ-28", "Elektronika-60", "Iskra-226" and "Iskra-1256" which can be used to develop a wide range of learning and testing programs.

The authors complain that institutes are not receiving enough assistance from central organizations in solving these problems. They cite the example of an interchair curriculum, "Principles of Computerized Processing of Medical Information and of Computer Technology", which was approved recently by the USSR Ministry of Health's Main Administration for Educational Institutions. This curriculum emphasizes theoretical training at the expense of clinical information processing, which the authors call the most important and difficult part of the discipline. It is allotted only 25 percent of study time.

This curriculum is contrasted with an interchair curriculum which has been prepared for adoption on a temporary basis at the Kuybyshev institute. It calls for theoretical instruction to be provided by the institute's chairs of physics, biology and physiology, and for clinical information processing to be studied in the chairs of propedeutic therapy and of roentgenology and radiology. The authors suggest that the latter become the institute's chief division in this field, since radiology is the area of clinical practice in which computer methods (computer tomography and topometry, processor analysis of radioimmunologic studies, etc.) are employed most extensively.

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**'ZDOROVYE' PUBLIC HEALTH SURVEY: LACK OF PROGRESS IN BUZULUK**

Moscow PRAVDA in Russian 14 Dec 86 p 2

[Article by G. Sazonov, PRAVDA correspondent, Orenburg Oblast]

[Abstract] A year has elapsed since the mid-size city of Buzuluk in Orenburg Oblast was visited by PRAVDA correspondents conducting the "Zdorovye" public health survey in the RSFSR. Now, it seems there has been some movement in the construction of hospitals. However, on the whole it seems that there is still a lack of coordination and interdepartmental fragmentation. Construction of a pediatric clinic still remains just a dream, and a new water-treatment facility is still in the initial planning stages. Four preventive sanatoria in Buzuluk remain underutilized, and there appears to be no effort to use them as clinics. Obviously, larger expenditures will bring some positive changes in the final analysis. But it must be understood that half-measures will not do and that an all-out effort must be made to improve the efficiency of health delivery in Buzuluk and adjacent areas.

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**'ZDOROVYE' PUBLIC HEALTH SURVEY: OLD AND NEW PROBLEMS IN VOLOGDA OBLAST**

Moscow PRAVDA in Russian 12 Dec 86 p 3

[Article by L. Slavolyubova, Vologda Oblast]

[Abstract] The "Zdorovye" public health survey carried out by PRAVDA correspondents last year in the RSFSR revealed that health care delivery in the rural areas of Vologda Oblast was in a particularly bad state. Now, a year later, a visit to the affected areas shows that after initial enthusiasm and a spurt of activity after our article appeared, things have gone back to normal. That is to say, progress has been limited and everyone points the finger at someone else. More must be done to attract physicians, nurses, and feldshers to the area, and to create satisfactory working and living conditions for them. Resolute efforts must be made by party and government officials to overcome inertia and improve the material foundations for a strong health service. The construction of clinics, hospitals, and dispensaries makes no sense if there is no one to staff them, underscoring once again the need for a multifaceted approach to health care delivery.

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'ZDOROVYE' PUBLIC HEALTH SURVEY: IMPROVEMENTS IN BASHKIRIA

Moscow PRAVDA in Russian 13 Dec 86 p 3

[Article by V. Prokushev, PRAVDA correspondent, Bashkir ASSR]

[Abstract] A year ago PRAVDA correspondents carried out a survey in several areas of the RSFSR on the state of public health, noting with concern a lag in medical services in some of the rural areas. However, things have much improved in Dyurtyuli in the Bashkir ASSR. A new hospital has been constructed and other services have been improved and modernized. A mobile dental clinic is now in full operation, and several outpatient facilities are either under construction or in the planning stages. Problems remain in securing the services of medical personnel and in providing them with living quarters, much of it due to lack of decisiveness on the part of the Bashkir Health Ministry and State Plan authorities. The outlook for public health on the whole is good, although considerable problems remain to be overcome to attain excellence.

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## RADIATION BIOLOGY

### V. KOROGODIN AND RESEARCH ON RADIATION DAMAGE TO LIVING ORGANISMS

Moscow LENINSKOYE ZNAMYA in Russian 21 Dec 86 p 4

[Excerpt] Scientists say that there is nothing more practical than a good theory. Those who are familiar with the work of specialists of the biological research sector of the Nuclear Problems Laboratory at the Joint Institute for Nuclear Research (OJYal) in Dubna can attest to the truth of this statement. Our newspaper has already reported on the work of the program called GENOM. A new program called RITM has become a logical continuation of it. Our correspondent recorded the following comments of Doctor of Biological Sciences, Professor Vladimir Ivanovich Korogodin, head of the biological sector, about this program:

As a result of the program GENOM, which has been completed, laws have been formulated that define the mechanism of ionizing radiations' effects on living cells. This work takes on particular timeliness in the light of recent events connected with nuclear power engineering's difficult path of development, and also because of the clear danger of a thermonuclear disaster.

Seven years ago, when the GENOM program was starting, senior science associate Ye.A. Krasavin and I advanced a hypothesis whose underlying postulate was that the effectiveness with which a cell restores itself following radiation damage decreases as linear transmission of the energy of ionizing radiation increases.

The corollaries of this hypothesis could be verified experimentally. As a result, Krasavin and S. Kozubek, a Czechoslovak scientist, formulated a biophysical theory of the action of ionizing radiations on living cells.

Basic studies were made of bacteria cells, and similar studies are being conducted on cells of yeasts and mammals. These observations make it possible to state that the radiation sensitivity of cells of all living organisms without exception, and also changes in this sensitivity, depend on only three factors: the structural organization of the genetic apparatus, the genotype that controls regeneration following damage, and the physical properties of the radiation.

What do we gain in practice from this knowledge? The susceptibility of any organism, including the human body, to radiation can be learned when these three characteristics are known.

But this is only one side of the work. How does radiation act upon genetic structures? Why can it stimulate growth? Or why does radiation mutagenesis occur? This will be the central direction of our work in the next five years. Answers must be found to questions such as why do mutations occur from the effect of radiations, and why do new organisms acquire traits that their ancestors did not possess.

A group of associates under Krasavin's direction is studying the mechanism of radiation mutagenesis in bacteria, and we are conducting experiments on yeast cells with another group. Also continuing is research of biologically effective procedures for producing effects with magnetic fields on nerve cells and cells of certain plants. Doctor of Physical-Mathematical Sciences V.I. Danilov is directing this research.

As a member of the operating commission of radioecology experts that was created under the presidium of the Ukrainian Academy of Sciences to coordinate scientific research aimed at dealing with the consequences of the accident at the Chernobyl' Nuclear Power Station, I can judge the practical importance which has now been acquired by the theoretical research on determining the effects of radiations on living organisms. This work, which has appeared to be of purely academic interest, has become most timely, to our great regret.

One of the centers which is studying and formulating main directions in this field is the commission on reliability of biological systems under the USSR Academy of Sciences' scientific council on problems of biophysics. These scientists are engaged in forecasting the situation on the one hand, and in formulating practical recommendations aimed at reducing the adverse ecological consequences of the accident, on the other, V.S. Yevseyev, Krasavin and A.P. Cherevatenko from OIYaI will also take part as experts in this work. It is under the direction of G.G. Polikarpov, corresponding member of the Ukrainian academy and one of the most eminent specialists in radioecology of bodies of water.

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MISCELLANEOUS

REGIONAL RESEARCH CENTER OF MEDICAL ACADEMY OPENING IN TOMSK

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Jan 87 p 2

[Text] The country's first regional research center of the USSR Academy of Medical Sciences opened yesterday in Tomsk. A number of scientific research institutes which are working on problems of cardiology, oncology, medical genetics, pharmacology and mental health have been combined into a single organization with common research and production facilities.

Combining these forces will permit more precise coordination of research aimed at developing models of preventive-medical services covering the vast territory east of the Urals, particularly the oil-producing regions of West-Siberia. Plans call for beginning the construction of a medical city in the taiga next year, on the outskirts of Tomsk.

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SOVIET-HUNGARIAN FIRM CREATED FOR MEDICAL EQUIPMENT MANUFACTURE

Moscow VECHERNYAYA MOSKVA in Russian 25 Dec 86 p 2

[Article by A. Bakhtina]

[Excerpt] An agreement has been signed in regard to creating a joint Soviet-Hungarian enterprise called "Mikromed".

Professor V. Viktorov, director of the All-Union Scientific Research Institute of Medical Instrument Building (VNIIMP) and a USSR State Prize laureate, related: "Our institute has long-standing scientific-technical ties with Hungary's 'Medikor' firm. They began in the 1960s. This cooperation did not come about by chance. 'Medikor' is a well-known firm with much experience in industrial cooperation with many countries of the world. And one out of every three medical instruments produced in the USSR is based on developments of VNIIMP.

"The joint Soviet-Hungarian enterprise 'Mikromed' represents the first attempt at creating this kind of enterprise in our country, and it is a result of these scientific-technical contacts. The enterprise will have a common finance fund. Production and marketing of new-generation automated diagnostic apparatus and of unified microprocessor modules for medical uses will be the enterprise's main specialty. 'Mikromed' will service its products, providing its customers with this additional guarantee of high quality."

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